ENCYCLOPEDIA OF

DEVELOPING REGIONAL COMMUNITIES WITH INFORMATION AND COMMUNICATION TECHNOLOGY

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Encyclopedia of Developing Regional Communities with Information and Communication Technology

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Foreword

The *Encyclopedia of Developing Regional Communities with Information and Communication Technology* makes a valuable contribution to the very important matter of how people in developing countries can make the best use of information and communications technologies (ICT). The Internet, in particular, has promised much to the people of the world. Yet even as ICT have brought people together, they have at the same time fostered a great separation between those who have access to them and those who do not. They have increased the access of small communities to the world, but they have, at the same time, provided significant challenges to cultures, businesses, education, and social cohesion. They have added greater complexity, higher costs, growing rates of redundancy, and increasing gaps in knowledge. All in all, they have transformed most aspects of our lives.

Clearly, we cannot ignore these technologies. Our collective experience with them indicates that we need increasing knowledge in how to use them in a productive manner. Continuous learning and supportive education across all sectors of our societies and cultures is paramount to ensuring that we gain the most and lose the least from the information age.

The title of this encyclopedia challenges the reader to view the matter from a collective community perspective, one that encompasses public, private, and civil society sectors. It aims to address the increasing gaps in information, knowledge, business efficiency, and service delivery within and between developing and developed countries. This is the business of community informatics, which is about defining how we can use ICT to assist communities in achieving their social, economic, political, and cultural goals. It provides the reader with a wealth of information on issues such as e-commerce, e-education, e-health, e-governance and e-tourism. Further, it puts such information in different cultural contexts across Africa, the Americas, Asia, the Caribbean, Europe, India, the Middle East and Oceania.

ICT pose new questions to society. It would seem that the business use of ICT is well advanced. Far more complex and pressing are questions relating to the social appropriation of ICT by the communities, so as to enable increased self reliance, increased participation in decision making, and improved delivery of community services. If we are to address these matters in ways that protect and enhance diversity amongst peoples of the world, we need to place increasing emphasis on lifelong learning.

Such efforts must help people understand and develop processes for effective use of ICT. They must also help governments, policy makers, businesses, and civil society develop cohesive programmes beyond the provision of access to ICT as an end in itself. We must prepare our societies for the next wave in the development of ICT that will make them increasingly mobile and increasingly accessible. We must do this in ways that empower our diverse communities and in ways that ensure that our citizens are well prepared to use these technologies to contribute to their governance, self-reliance, and the maintenance of their cultural heritage.

This encyclopedia is a useful tool in achieving these ends and I am pleased to recommend it to practitioners, researchers, policy makers, civil society representatives, and those looking for more appropriate methods of delivering the host of services that are important in our society.

Naledi Pandor, MP
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Preface

DEVELOPING REGIONAL COMMUNITIES WITH INFORMATION AND COMMUNICATION TECHNOLOGIES

It is becoming evident that a "digital divide" is developing between those who are in a position to take advantage of information technology (IT) enabled opportunities and those who are not. This disadvantage can be caused by the lack of access to information and communication technologies (ICT) or by the lack of skills, experience, motivation, support and awareness that are necessary for making good use of ICT. This divide is to a great extent a function of the rural-urban divide, and so disadvantaged groups exist in both developed and developing countries. For example, indigenous populations such as those that can be found in the developed countries of North America, Europe, Australia, New Zealand, together with people from developing countries in the Indian Sub-Continent, Africa, South America and the Asia-Pacific region, are regularly over-represented in statistics relating to the lack of access and use of ICT. Also, people living in regional towns (as opposed to metropolitan cities) in North America and Australia may well have access to ICT, but the actual use of ICT (e.g., home access to the Internet) is well below the national average.

The purpose of this encyclopedia is to outline how ICT can be used for regional transformation and how regional communities can close the digital divide. It does this by bringing together definitions, explanations, research, action research, best practice and case studies to develop and explain policy, practice and theory development in the use of ICT to strengthen regional economies and communities.

This encyclopedia covers the theoretical, thematic and country specific issues of using ICT to develop the social, economic and cultural capital in regional communities around the world. The articles blend theory, policy and practice in a way that encourages an integrative cross-sectoral approach in the use of ICT to increase both social and cultural capital as a means to increased sustainability for regional communities.

Thus, it provides practitioners, regional elected representatives, public service agencies, community groups, international and regional development bodies, researchers, academics and students with successful strategies and principles of ICT use to address regional needs, especially social, health, economic and sustainability problems. It also provides explanations and very practical information on methodologies and hard and soft technologies for practitioners in the field of community development.

The encyclopedia covers five broad topics and sub-categories. The five broad topics are: Theoretical and General Issues; Thematic Issues; Regional and Country Issues; Methodologies; and Technologies.

TOPIC 1: THEORETICAL AND GENERAL ISSUES

This topic comprises descriptive and research articles that outline some of the major concepts and/or develop theories relating to the use of ICT to develop the social, economic and cultural capital in regional communities.

In her article "Civil Society and the New Economy" Susana Finquelievich addresses the issue of the relationship between civil society and the new economy that is being increasingly understood as part of the development process both in the developed and the developing countries. She analyzes the advantages, risks and challenges faced by civil society in the new economic context, and proposes action for civil society organizations. From her account, it is clear that there is a need for civil society to "appropriate" ICT if regional communities are to take advantage of the new economy.

The social appropriation of ICT is emerging as a research and practice field called Community Informatics (CI)—one of the categories of Topic 2 of this encyclopedia. In their article "Assimilation by Communities of Internet

Technologies", Geoff Erwin and Wal Taylor outline how various CI research groups are contributing to the knowledge, policy and practice of enabling of communities with Internet technologies in order to boost local economic and social development, as well as enhance personal empowerment. They describe a project at Cape Technikon in South Africa that aims to establish a research, teaching and community engagement platform in Community Informatics.

Many remote, rural and disadvantaged urban communities in low-income nations are still unable to access ICT tools and services that can help them improve their lives. One way of overcoming this digital divide is by establishing multi-purpose community-based telecentres. This is the theme of the article "Telecentres in Low-Income Nations" by Colin R. Latchem. He describes telecentres as "essentially one-stop shops providing communities with ICT-enabled education, training, information and e-commerce and empowering them in their self-development". His article describes how such centres can help to narrow the technology skills gap and aid development. In the article "Sustainable Telecentres for Local Development", Michele Cocchiglia examines the multiple dimensions of the concept of sustainability as it relates to community telecentres in order to provide new insights and advice to facilitate the development of future initiatives.

Providing ICT access to remote, rural and disadvantaged urban communities can also assist in promoting local culture. Digital libraries permit materials of local relevance to be made available to a wider public, thus reinforcing local culture and development. In his article "Promoting the Culture and Development of Regional Communities with Digital Libraries", Cavan McCarthy outlines specific examples of digital libraries with strong impact on regional communities. He then discusses and evaluates the factors that contribute to the success of community-relevant digital libraries and the constraints affecting the field.

Developments in ICT have eroded traditional spatial and temporal barriers. For example, advancements in the ICT industry have provided a number of firms with the opportunity to lower some operating costs and allow their employees to work from home. In their article "Telework and the Canadian Environment", Stefane M. Kabene, Raymond Leduc and Rick Burjaw outline the importance of this for the Canadian environment. They caution that "working from home is not a panacea for various working environment situations". The article "Connecting Dispersed Communities on the Move" by Juliet Jain and Glenn Lyons examines current understandings of spatiality, regional connection, and travel time within transport studies and the social sciences. It argues that travel time is often actively appropriated for a range of activities, some of which elude quantification and economic evaluation, and thus argues for a new research agenda for travel time use, that considers the many facets of 'on the move' regional connectivity. In her article "Using Virtual Mobility to Alleviate Aspects of Social Exclusion", Susan Kenyon continues the theme of mobility. Her article highlights the role of spatial and temporal accessibility barriers in social exclusion and the role of ICT, specifically, the Internet, in overcoming these barriers. The article suggests examples where Internet use can, not only replace the need to travel, but also provide a new means of access, to activities from which individuals or communities were previously excluded.

The work of those who design, implement, and manage ICT projects aimed at stimulating social and economic development are engaged in activities that have potential to impact the culture of the host community. In his article "Convergence of ICT and Culture", Matthew Mitchell explores three analytical frames in which this cultural impact can be conceptualized: Structural Convergence, Technological Convergence, and Cultural Convergence.

TOPIC 2: THEMATIC ISSUES

This section comprises research articles and case studies that cover various thematic issues of using ICT to develop the social, economic and cultural capital in regional communities. The sub-categories included are: Community Informatics; E-Commerce; E-Governance; Education; Health; and, Tourism.

Community Informatics

Community Informatics—the social appropriation of ICT for local benefit—can help to overcome the digital divide between rural and urban communities in developed and developing countries. In their article "The Need for Community Informatics in Malaysia", Jayapragas Gnaniah, Peter Songan, Alvin W. Yeo, Hushairi Zen and Khairuddin Ab. Hamid describe a baseline study of the Long Bedian community in Sarawak, Malaysia, to determine its communication patterns. Findings from the study revealed that there is a distinct information gap between the Long Bedian community and the urban community. They consider the implications of these findings on the development of a telecentre for the community to help to overcome the digital divide. In their following article "e-Bario and e-Bedian Project Implementation in

Malaysia", they describe the e-Bario project, a community informatics research initiative undertaken to provide opportunities for this remote community in Sarawak, Malaysia, to develop socially, culturally, and economically. The results of the initiative show the many ways in which ICT can be used to improve the lives of the marginalized groups.

A major difficulty associated with implementing community networks is achieving self-sustaining levels of activity. In their article "Critical Mass and Self-Sustaining Activity", Martin R. Gibbs, Phillipa Wright and Michael Arnold identify five factors that contribute to achieving self-sustaining levels of community network activity. These factors are: the aggregation of users and of content; the affordances of networking technology; the shape of community and its relations; the response to community engineering; and the recognition of the technology. In his article "The Arab World, Culture and Information Technology", Mohamed El Louadi considers the cultural aspects of IT adoption in the Arab world. He highlights some Arab traits that are not grasped in existing models of IT adoption.

The concept of the Smart Community is to develop innovative partnerships among community institutions and organisations, including governments, local business and other private sector interests to take full advantage of the digital economy. In their article "Industry-Relevant Smart Community Partnerships", Colin Baskin, Michelle Barker and Peter Woods show how, through united effort, a community is better able to leverage resources to launch projects that both exploit the potential of the ICT infrastructure, and maximise the productive effort of its members.

Web portals have become the most widely used interface for online communities to meet and interact. Those that are specifically designed to provide resources and meet the needs of a particular community are known as community portals. In their article "Measuring the Maturity Level of a Community Portal", Lejla Vrazalic and Peter N. Hyland propose a model for measuring the maturity level of a community portal. The model is based on three development phases, each phase involving a number of social, technical, administrative, funding and policy dimensions, all of which have implications for the long-term sustainability of the community portal. In her article "The South Australian Common Knowledge Community", Helen Robinson describes a project designed to provide a single access point for South Australian communities to share information and improve knowledge, thus raising awareness about the community services sector in South Australia, as a whole. Alfredo Eurico Rodrígues Matta, in his article "Trans-Urbanities and Collaborative Environments in Computer Networks", discusses how network communities can transcend local processes and settings, making possible the construction of trans-urbanities and inter-communities.

E-Commerce

The lack of standard definition for e-commerce presents a challenge to researchers and leads to inaccurate comparisons. In their article "The Definition Dilemma of E-Commerce", Aileen Cater-Steel and Shelly Grist analyse various definitions to create a classification grid. Their recommendations provide guidelines for researchers interested in analysing the adoption of e-commerce by regional communities. ICT researchers and practitioners are well aware of the cultural challenges brought by a global market. In her article "Cultural Barriers of Human-Computer Interaction", Deborah Sater Carstens argues that there is a need to develop a model of cultural barriers to human-computer interaction (HCI) to help designers of ICT avoid these barriers so as to enhance a company's ability to conduct business internally and with international businesses and customers. Kenneth Msiska, in his article "E-Commerce in the Sub-Saharan Africa" examines the growth of the Internet and electronic commerce, the challenges and controversies surrounding e-commerce adoption and the future trend for e-commerce activities in the sub-Saharan Africa.

Sustainable small and medium sized enterprise (SME) growth is a key driver of economic, social and cultural development in regional communities. In his article "Government Procurement ICT's Impact on the Sustainability of SMEs and Regional Communities", Peter Demediuk discusses how ICT can increase the share of the government procurement pie for SMEs if the technologies provide a vehicle for greater transparency and information access. In "Regional Tourism and the Internet in Australia", Patrice Braun discusses the reluctant adoption of e-commerce technologies by regional Australian tourism SMEs. Similarly, Wayne Pease and Michelle Rowe in "E-Commerce and Small Business in Regional Australia" point out that many SMEs, especially in rural and regional areas of Australia, tend to adopt e-commerce 'just by chance' or in a causal manner which tends to be operational rather than strategic. They look at adoption enablers and barriers, and explore these issues via a case study of a regional SME located in the Wide Bay region of Australia. In their article "Adaptive Use of ICT in Response to Disintermediation", Pramod Sharma, Dean Carson and Andrew Taylor discuss how WebMAIL (an online information management system) is an adaptive response to the disintermediation occurring in the Australian travel agency sector as it moves to online product distribution systems from more traditional tourism product supply chains.

E-Governance

ICT offers citizens new ways to engage with democratic processes. In their article "Citizen-Oriented Decision Making", Auli Keskinen and Tuomo Kuosa describe and compare the development work under way in various EU projects on e-democracy by introducing a Citizen-oriented Model that emphasises citizens' needs as the fundamental approach to societal decision making and regards citizens as collaborative decision makers. In "Transforming Democracy through ICT", Andy Williamson describes a five stage model for community ICT engagement and maturity which is non-linear and temporal. Such a model is useful in developing effective e-democracy practices within communities and as a way of mapping progress within a wider community or regional setting. Ulrike Kozeluh, in "E-Democracy as a Contemporary Framework for Citizens' Deliberation", reflects on a theoretical framework for e-democracy and the main controversies and problems of the usage of new media tools in the context of citizens' participation in policy making processes. Similarly, Andriy Pazyuk in "Extended Democratic Space for Citizens' E-Participation" presents some theoretical provisions outlining the concept of e-democracy and its applications assigned to increase citizens' participation in public management. His article describes the methods used to increase the potential of e-democracy, evaluates some cases of e-participation techniques usage and lessons learned in practice.

In "Assessment of E-Government Projects", Rahul De' presents a framework for the assessment of e-government projects in less developed countries. This framework includes an analysis of the supply-side and demand-side stakeholders; an analysis of second order effects that arise from the use of the system; and the issue of incentives that determines the extent of corruption in the system. In his article "Establishing a 'Knowledge Network' of Local and Regional Development Subjects", Olexandr Molodtsov considers the problems of the informational interaction between the state and the subjects of local and regional development and outlines the configuration of information and communication systems of local and regional development.

Education

The adoption and innovative use ICT in education can have positive outcomes for regional development, e.g., boosting opportunities for growth in e-commerce, e-business and e-learning. Of particular importance are the opportunities for collaborative learning afforded by ICT. In their article "Choosing Online Learning Communities or Collaborative Learning" Daniel Teghe and Bruce Allen Knight critique a number of ideas and notions that are linked to the concept of online learning 'communities'. They suggest that, rather than be overly concerned with creating communities, online educators should focus on the pragmatic use of online technologies to provide opportunities for learners to participate and interact on their own terms in online learning environments. The theme of collaborative learning is continued in Giorgio Agosti's article "Distance Education in the Era of Internet" in which the author looks at how modern distance education is taking advantage of ICT by transforming self-study into collaborative learning and increasing the impact of education on communities. Bijan B. Gillani, in his article "Problem-Based Learning and the Design of E-Learning Environments" discusses the design and the development of an e-learning site that applies a problem-based learning model to create educational environments that encourage students to be assisted by faculty and more capable peers for deeper understanding of the curriculum. In "Cognitive Theories and the Design of E-Learning Environments", the same author discusses how cognitive developmental theories have contributed to the design, process and development of constructive e-learning environments, and describes an example developed by NASA that used the Web as an appropriate instructional delivery medium to apply Piaget's cognitive theory to create e-learning environment.

The use ICT in education is particularly important in developing countries. In their article, "ICT and Distance Learning for Agricultural Extension in Low Income Countries", Colin R. Latchem and Ajit Maru describe how ICT and distance learning can be harnessed to the newer extension methods to provide greater access for these smallholders and includes examples of how these new methodologies and technologies are being applied around the globe. Antonio Santos, in "Information Literacy for Telecenter Users in Low-Income Regional Mexican Communities" proposes a methodology to increase information literacy among people who attend telecenters in low-income communities in Mexico. The author suggests the employment of an alternative perspective on the use of ICT for social development based on information literacy and social constructivist pedagogy. Higher education in Africa is tasked with the duty of creating the capacity for sustainable development and the democratization of knowledge. In his article "Preparing African Higher Education Faculty in Technology", Wanjira Kinuthia presents an overview of the state of ICT in African higher education institutions in relation to challenges and opportunities. In his article "Expanding E-Commerce into E-Ducation", Kirk St.Amant presents ideas on how creating strategic partnerships between businesses and educational institutions can lead to e-commerce relationships that help both parties succeed in the globalized economy.

The projects described by Greg Whateley, Ian Bofinger and Peter Calvo in their article "'New Frontiers for The New Australian Institute of Music", represent a bold step forward by The Australian Institute of Music (AIM) to make its mark on the regional, national and international market. The article outlines the processes by which 'The Virtual Institute of Music' and 'The Virtual Institute of Management Sciences' entities have been integrated into the operation of the larger Institute giving domestic and international students a whole new range of delivery and content options. Leone Wheeler and Cheryl Lewis-Fitzgerald describe the development of RMIT Learning Networks over a period of four years in their article "Building a Framework for the Development of RMIT Learning Networks". Although it began as a technology-led network based on the delivery of accredited programmes in local community learning centers, it is evolving into a framework based on community engagement and the development of sustainable partnerships with a range of organisations across not-for-profit, business, government and education. Susan Crichton looks at how to help at risk youth stay in school and adults return to learning centres, in her article "Intentional Online Learning Plans", and reports on the literature as well as a case study of actual practice with intentional online learning plans.

Health

The use of ICT in medical education and primary health care can improve the acquisition and dissemination of knowledge across geographic boundaries. In their article "Medical Education in the 21st Century", Stefane M. Kabene, Jatinder Takhar, Raymond Leduc and Rick Burjaw argue that in spite of many positive aspects of ICT in healthcare, much remains to be done, especially in developing countries, to make it fully effective and avoid the deepening of the digital divide in healthcare education. Zubeeda Banu Quraishy, in her article "Implementation of a Health Information Systems Programme" comments that the quality of existing information management practices within the Primary Health Care (PHC) sector in Andhra Pradesh in India is extremely poor. She describes a Health Information Systems Programme that seeks to strengthen information practices within the Primary Health Care (PHC) sector with the larger aim of improving health care delivery for the rural community.

Tourism

Developments in ICT impact on the tourism and hospitality industries in regional destinations and sound business planning is required to enable tourism and hospitality enterprises to cope more effectively with the rapid rate of change. In "Developing Regional Tourism Using Information Communications Technology", Dean Carson examines a small number of ICT initiatives which may present opportunities for the continuing development of regional tourism industries. Patrice Braun, in her article "E-Commerce and Small Tourism Firms", focuses on regional network development within the tourism industry and discusses some of the issues small tourism firms are facing in becoming part of the networked economy. Recent developments in national tourism policy in Australia and a growing volume of literature signal increasing recognition of the role of strategic information and research commodities in the growth and sustainability of regional tourism. In Australia there is a poor history of application for such commodities by tourism firms and organisations. In his article "ICT and the Tourism Information Marketplace in Australia", Andrew Taylor examines a conceptual model of the marketplace in which tourism information commodities are exchanged, the Tourism Information Marketplace (TIM), demonstrating the potential for ICT technologies to promote the diffusion and application of information commodities. For tourism operators, destination marketing systems offer the benefits of website marketing together with the benefits of cooperative marketing. Glen Hornby illustrates how stakeholder issues can present obstacles in taking advantage of destination marketing technology, and examines the issues that affect tourism operator participation, in his article "Developing Regional Destination Marketing Systems".

TOPIC 3: REGIONAL AND COUNTRY ISSUES

This section comprises research articles and case studies that discuss the use of ICT to develop the social, economic and cultural capital in communities in specific countries, in Africa, the Americas, Asia, Caribbean, Europe, Indian Sub-Continent, Middle East, and Oceania.

Africa Region

The successful integration of ICT into Africa's governance is threatened by a number of technological and human barriers. In"E-Africa Initiative for Good Governance", Gianluca Misuraca highlights the main challenges for e-governance in Africa and presents the key elements of the Framework for Action and the draft Plan of Action, as agreed by the promoters of the e-Africa initiative, CAFRAD, NEPAD and UNDESA. In the "NetTel@Africa", Matthew Mitchell describes the purpose, structure, principles, practices, and lessons learned of the NetTel@Africa program developed through a transnational collaboration of university, regulatory, private sector, and governmental organizations. "Telecommunications Sector and Internet Access in Africa" by Vanessa Phala summarizes the key findings from two main research projects conducted by the Research ICT Africa! network members between 2003 and 2004 namely, the Fair Access to Internet (FAIR) Report and the Sector Performance Review.

The initiative described by Sylvie Siyam Siwe and Clarisse Loumou Loe in the article "Open and Distance Programme for Rural Women", aimed to use open and distance training programme to empower rural women and enable them to implement income generating activities and to practice effective local leadership in Cameroon. Countries with developing economies like Ethiopia are faced with chronic underdevelopment. In Ethiopia, for example, 82% of its population lives under US$1.00 per day. Solomon Negash, in his article "ICT for Ethiopian Community Development" addresses two critical issues to reverse underdevelopment: ICT assimilation and ICT supported local content development. Godfred Frempong and Imoro Braimah tackle the issue of access to ICT services in Ghana in their article "Assessing Universal Access to ICT in Ghana". They argue that although considerable progress has been made in improving access to ICT in Ghana, most of the services are urban based, and interconnection, affordability and low e-literacy level remain challenges that need to be addressed. The article by John Pryor describes a development awareness initiative in Ghana—the Fiankoma Project. His article "Analysing a Rural Community's Reception of ICT in Ghana", reports on people's attitudes to ICT before the intervention, describes the project's approach to using digital media and appraises its effect on attitudes towards community development. It then develops a framework for considering how the use of ICT might impact on rural people in disadvantaged contexts. Pamela McLean provides an illustrative case study on how the informal communications infrastructure in rural Nigeria is being overlapped with the communication systems provided by the Internet and other ICT, in her article "An ICT Enabled 'Community' in Rural Nigeria and the UK".

Several of the articles in the encyclopedia describe South African ICT development initiatives. The article by Nicole Arellano, Wallace Chigona, Jeanne Moore and Jean-Paul Van Belle, "ICT-Based Community Development Initiatives in South Africa", gives an overview of the wide range of initiative types that are being undertaken, rather than attempting to be a comprehensive census. Thus it serves as a good introduction to the different intervention models which are being followed. The article "Clustering Dynamics of the ICT Sector in South Africa" by Sagren Moodley focuses on the analysis of two regional ICT cluster case studies in South Africa which illustrate a clear and intensifying concentration tendency of ICT-related production and research and development. Johnathan Trusler and Jean-Paul Van Belle present an in-depth case study analysis of a rural telecentre in their article "A Rural Multi-Purpose Community Centre in South Africa". Teresa Peters uses the City of Cape Town to provide an illustrative example of a local government committed to putting ICT to work for social and economic development, and driving the changes necessary to ensure ICT is used effectively, in her article "Crossing the Digital Divide and Putting ICT to Work to Improve People's Lives".

In their article "Improving Electronic Information Literacy in West African Higher Education", Ibrahima Poda and William F. Brescia describe some of the obstacles and the main challenges affecting electronic information literacy in Sub-Saharan West Africa, which include limited telecommunications infrastructure, weak policy and regulatory frameworks, limited human resources, and lack of support and expertise. Although a number of higher education institutions have established distance education departments, and new ways to use the Internet including video-conferencing and other multimedia applications, the authors argue that strategic planning and campus leadership are needed to improve ICT applications in Sub-Sahara. In his article "Forging Partnerships to Provide Computer Literacy in Swaziland", Cisco M. Magagula examines the impact of the Computer Education Trust (CET) set up in Swaziland to extend computer literacy and vocational ICT to every child in secondary and high schools in Swaziland. The author concludes that CET faces some major challenges in that there is a lack of a curriculum on computer education that is examinable, there is a low level of ICT education in schools, there is a lack of properly trained teachers to teach computer education as a fully-fledge subject in the school curriculum, and the slow pace of building computer laboratories by schools since this depends upon school fees and contributions from parents.

In his article "How the National E-Strategy Shapes Competitiveness in the Information Economy", Alf Neumann discusses the connection between an e-strategy and the development of dynamic ICT businesses in Tunisia. The article "E-Mail as a Teaching Supplement in Tunisia" by Mohamed El Louadi reports on an experiment conducted at the Higher Institute of Management in Tunisia over three consecutive years that involved the use of e-mail for communicating with and distributing lecture notes to students enrolled in an elective course. Peter G. Mwesige examines the promise and limits of Internet use and access in Uganda in his article "The State of Internet Access in Uganda". The article focuses on the users of two major public access points: Internet cafés and telecentres. It argues that while more Ugandans are getting online following the proliferation of such public access points, the risks of exclusion of large sections of the population from the information society remain.

Americas Region

Many ICT-based regional development initiatives have been initiated by governments in the Americas, including virtual communities, local or regional portals, and e-marketplaces. In their article "E-Business for SME Development", Éliane M.-F. Moreau, Louis Raymond and Bernard Vermot-Desroches outline the needs of manufacturing and technological SMEs in the Mauricie region of the province of Quebec, Canada. They identify promising initiatives for the development of SMEs, including the integration of tools and advanced business practices within a regional e-business appropriation portal.

In "Leveraging Digital Multimedia Training for At-Risk Teens", Timothy Shea and Craig Davis describe a programme in the USA in which 15 inner city, at-risk teenagers were provided a unique summer learning opportunity creating a high-quality 26-minute video documentary with audio, music and video tracks. Their article describes this extremely cost effective community-based ICT project, the students' experiences in this program, and how the right technology combined with the right curriculum can dramatically enhance an educational experience, open up new career opportunities, and improve the economic capital of a community.

Ester Kaufman in "E-Government and E-Democracy in Latin America" reports on the stages of development of e-government in Latin American Countries. The stages of development of e-government are discussed on the basis of the existing models and other models which are developed by the author; alignment with the literature; and, an examination of the national portals. Simone Cecchini in "Poverty, Inequality and New Technologies in Latin America" introduces theories and data that explain why an internal divide exists within Latin American Countries, presents projects that are attempting to use ICT for poverty reduction, and proposes policies to create a more equal information society.

Asia Region

In his article "Telecommunication Problems in Rural Areas of Armenia", Gevorg Melkonyan outlines the importance of ICT for sustained and dynamic development of villages and in the integration of the agro-industrial sector of the country into the global economy. He concludes that a solution to the problem of general access of the population to the Internet and ICT in Armenia is possible only by means of the creation of community Internet centres in the small towns and villages together with familiarization programs for the population.

In "The Role of Multinationals in Recent IT Developments in China", Michelle Rowe explores developments in China with respect to the IT industry. She provides examples of investment activity by multinationals and an overview of the industrial city of Shenyang in north east China, with IT playing a major role in this development. The same author, in the article "Information Technology Standards in China" describes China's stance in relation to the setting of standards.

Kelly Hutchinson, in "Cambodian Youth Making Connections" contends that the uptake of new ICT highlights the emergence of an urban elite; a digital elite whose use of ICT is helping define the new generation and secondly facilitate connections that build community within the Khmer diaspora. In "Pedal Powered Wireless Internet in the Laotion Jungle", Neil Anderson describes an exciting project undertaken by the Jhai Foundation to bring wireless, pedal-powered, Internet connectivity to isolated Lao communities to improve communications and trade. The article includes a discussion about the technical features of the project, the staff involved and their roles along with a broader examination of important issues associated with bringing new technologies to people living in traditional lifestyles in isolated communities, such as cultural imperialism and sustainability.

In "Planning for Electronic Government in a Remote Malaysian Site" A. Lee Gilbert lays out a basic structure, process, and content for a plan for the electronic delivery of government services, and provides a planning template that serves

as a starting point for jurisdictions in a similar context. Jayapragas Gnaniah, Alvin W. Yeo, Hushairi Zen, Peter Songan and Khairuddin Ab. Hamid describe the "e-Bario and e-Bedian Project Implementation in Malaysia". They compare the approaches taken in initiation, implementation as well as the outcomes of the e-Bario and e-Bedian project.

"Introducing Electronic Governance in the Philippines" by Vicente D. Mariano describes how the government of the Philippines is poised to maximize the use of ICT to improve public service at the local government level through the adoption of the E-LGU Project, which advocates the use of open-source technology, reduction of our heavy reliance on expensive proprietary software and consequent up-to-date training and upgrading. Ian Weber and Eric T.K. Lim in their article "Selling Singapore's E-Lifestyle Initiative to Late Adopters" examine the communication strategies employed by the Infocomm Development Authority of Singapore (IDA) to promote the diffusion of the world's first nation-wide e-lifestyle initiative. Findings indicate that IDA's social marketing strategies played an important role in the success of NITLP because they identified and linked cogently to the communication behaviors, attitudes and cultural values of targeted groups. The lessons learnt from Singapore's e-lifestyle initiative serve as key indicators to countries in the Asia-Pacific and internationally of how to conceptualize, implement and foster community involvement in the development of e-inclusive societies and knowledge-based economies.

Thailand has had an ICT leapfrogging initiative under consideration and development for a number of years. In their article "Technology Leapfrogging in Thailand", Louis Sanzogni and Heather Arthur-Gray point out that the initial impetus appears to have stalled somewhat, so some parallels are briefly drawn with the successful advancements in technology leapfrogging enjoyed by South Korea in the hope that this will highlight opportunities for Thailand. In the next article, Heather Arthur-Gray and John Campbell consider "Education Trends in Thai Businesses Utilizing Information Technology". Their article incorporates an analysis of Educational trends from a survey of non-agricultural Thai businesses in Chiang Mai. The research considers the employees in these businesses, what the current trends are, and whether these trends may or may not support electronic enablement and digital divide reduction. In "Wireless in Vietnam", A. Lee Gilbert explores the dynamics of the interplay between demand and supply in the context of the interests of the key actors in mobile services, and then applies scenario analysis, as a useful planning tool for evaluating entry mode and policy options, to the case of evaluating investment in the mobile sector in Vietnam.

Caribbean Region

E-commerce in Caribbean developing countries is viewed as a complex but challenging business issue. In these small island states, the peculiar set of social, economic, technical, and legal issues tend to affect these economies. Although businesses in the Caribbean Region have realised the potential benefits that can accrue from e-commerce, several challenges remain to be faced before they can 'leap-frog' into the global economy. In his article "E-Commerce Challenges for Caribbean Businesses", Richard M. Escalante uses the results of a 2002 'Barriers to E-commerce' country survey, to examine both the economic and non-economic obstacles faced by businesses, given the present developments toward a liberalised economy in the Region. Simon Fraser, in his article "Caribbean Companies and the Information Superhighway" seeks to highlight that while the Internet can provide companies in the English speaking Caribbean with significant opportunities, there are also potential negative consequences. Specifically, these include downward pressure on prices, loss of market share and in extreme scenarios almost total loss of markets. In her article "ICT and the Efficient Markets Hypothesis", Andrea J. A. Roofe discusses the contribution of ICT to the level of efficiency of the Jamaican financial markets. In her article, Marilyn Lewis considers "ICT in Medical Education in Trinidad and Tobago".

European Region

In their article "Employability Management of ICT Professionals", Dora Scholarios, Esther van der Schoot and Beatrice van der Heijden examine the management of employability of ICT professionals by small- and medium-sized enterprises (SMEs) in Europe. The article uses secondary data to characterize the ICT sectors in seven countries representing a range of markets, from highly developed to small and emerging, and presents a qualitative study of managers' in ICT SMEs attitudes towards employability and its management. Tarmo Kalvet, in "Digital Divide and the ICT Paradigm Generally and in Estonia", analyzes Internet usage among the Estonian population and specifically takes a closer look at Internet non-users and related barriers.

The article "Connecting the Unconnected in Rural Ireland" by Anneleen Cosemans describes the pilot project Schoolsat in Donegal which ran from February 2002 to February 2003 and was to investigate the potential of satellite

to provide Internet connectivity for schools. The article gives an account of the precise objectives of the project, its background and the major observations that came out of it about the nature of usage of the Internet in the participating schools, the learning benefits, the gender patterns and barriers to the success of the project.

There is ongoing global interest in the building of community memory for purposes of preserving cultural identity, documenting local history, promoting tourism and examining shared heritage. In "Capturing Community Memory with Images", Ted Leath describes the Magee Community Collection project, which demonstrates how ICT can be used to augment and enhance the capture and preservation of community memory.

In their extended article "Building Human-Centered Systems", José L. Moutinho and Manuel Heitor consider the development of selected projects which have been engaged in building information and communication networks in urban and regional environments, with the ultimate goal of developing networked places (or "digital cities and regions"). They argue that such networks have the potential to attract and mobilize people into a "culture of knowledge" and make public administration and markets more effective, but require, nonetheless, effective infrastructures, incentives and adequate institutional frameworks across time and space. In their article "ICT, Education and Regional Development in Swiss Peripheral Areas", Chiara Giorgi and Dieter Schürch look at the role of ICT in regional development and its influence socio-cultural identity, and examine several Swiss case studies.

Virtual Communities are new types of human groups that are facilitated by the advances in ICT. In his article "Developing Regional Communities in Turkey", Melih Kirlidog investigates obstacles and emerging virtual communities in rural areas of Turkey. Koray Velibeyoglu describes "Urban Information Systems in Turkish Local Governments", exploring the organizational and institutional issues associated with implementing urban information systems in the context of Turkish Metropolitan Municipalities.

"Distance Learning, Telematics and Rural Social Exclusion" by Matthew David seeks to build upon empirical research into distance learning via telematics through the examination of a project in the southwest of the United Kingdom. It discusses the theoretical and political difficulties that emerged when seeking to understand practical communication breakdowns in computer mediated learning and the associated action research designed to facilitate such learning, but which relate to the wider domains of both policy making and political practice.

In "Civic Space Portal", Olesya Arkhypska, Svitlana Bilous and Vitaliy Yarinich describe an NGO portal—the Civic Space Portal—that was created as an information and technological facility to improve e-presence and catalyze the influence of the third sector within Ukraine. Serge S. Azarov investigates the problem of identity in the emerging information society in his article "The Information Society in Ukraine".

Indian Sub Continent

In "Formation of a Knowledge-Based Society through Utilization of Information Networking", Hakikur Rahman discusses the concept of a distributed learning system that uses advances in technology to address relatively high levels of illiteracy. A challenge remains for the existing educational system, particularly the University sector to collaborate and bring their ICT infrastructure, knowledge and capacity into a collaborative effort which can then act as a backbone for Bangladesh to develop a platform for an Information Society.

The Indian economy is performing well in ICT growth but lags behind in ICT diffusion. It is important to give more attention to ICT diffusion as it will help in use and accessing ICT and its application thereby increasing productivity and achieving regional economic development. The article "ICT in Regional Development", by Saundarjya Borbara and Mrinal Kanti Dutta discusses a case study of Community Information Centres of Assam in North East India, a project implemented by Government of India to provide IT accessibility and its application in the rural areas of the region. Ashok Banerji and Saswata Basu describe a novel project in their article "ICT Aided Education for People's Empowerment". The primary focus of the project was to promote education and health awareness through the efficient use of ICT. The authors believe that the method of deployment is important rather than the technology itself. The "One Village One Computer Campaign in India" described by Anil Shaligram strives to facilitate the flow of subject knowledge held by experts to the contextual knowledge held by people and vice versa so as to lead to development.

In the article "Imagining APNA Punjab in Cyberspace", Anjali Gera Roy explores the reconstruction of a North Indian ethnic group, dispersed by the partition of the Indian subcontinent in 1947, in electronic space aided by digital and satellite networks, which interrogates the cartographic impulse in the making of the modern Indian nation that caused a rupture in the community's collective memory. The Integrated Child Development Services provides a package of services to children of 0-6 years and women of 15-45 years. Malathi Somaiah and V. Vijayalakshmi's article "Information Communication for Child Development Service" assesses the existing status of ICT in the delivery of these services. They argue for a well planned Management Information System at the taluk and district level.

Middle East Region

Traditional media tools in Saudi Arabia such as television and press are largely controlled by the government and any content considered as undesirable likely to be disseminated from them is generally censored. This has made it difficult for people with alternate points of view to get their messages across to others. The introduction of the Internet in the country and the emergence of political online communities (POCs), however, completely altered the situation. In "Political Online Communities in Saudi Arabia", Yeslam Al-Saggaf and John Weckert present the findings of an ethnographic study of POCs in Saudi Arabia, and discuss their role as media tools and facilitators of freedom of expression.

Oceania Region

In "Electronic Government in Small Island States", Janet Toland, Fuatai Purcell and Sid Huff explore the potential that recent developments in e-government offer to small island states. Their findings show that the use of websites and email is common in the public sector in the South Pacific, though there is little transactive use. The main opportunity offered by e-government would be increased transparency, and the main barriers were the low priority it was given by government, and poor telecommunications infrastructure.

Responsibility for the provision of broadband in regional Australia however is unclear, and yet Australia State and Federal governments are continuing in their push to reduce service delivery costs by providing more government services online and via broadband links. In her article "National Competition Policy and Broadband Provision in Australia", Alicia (Lucy) Cameron posits a model whereby local governments take on the responsibility of bandwidth provision (through either attracting external providers or constructing their own infrastructure), and are resourced through the horizontal fiscal equalisation process. In their article, Karin Geiselhart and Peter Jamieson consider "Sustainability Issues for Australian Rural Teleservice Centres". They show how successful rural teleservice centres have been able to use technology holistically to provide the flexible services and training to help them through turbulent times. Rather than being seen as a form of rural welfare, support for these technology hubs can be a valuable national resource for governments at all levels. In the article "Determining Whether ICT Improves Social Interactions", Raj Gururajan presents the results of a pilot project to ascertain whether ICT actually improves the quality of life by facilitating social interactions. In their article "ICT and Regional Development in Australia", Wayne Pease, Michelle Rowe and Lauretta Wright describe the development within the Hervey Bay region of Australia of information technology infrastructure which has in recent times, spawned the development of community based information technology driven organisations.

Gulf Savannah Development (GSD) is a not-for-profit regional development organisation for the Gulf Savannah, a remote, rural region of north Queensland, Australia. In her article "ICT and Developing Social Capital", Kate Sutcliffe discusses GSD's endeavour to encourage greater use of ICT as a tool to build the networks that would broaden the social capital base and deliver e-democracy and e-commerce through the Gulf region. Remote communities in Australia have access to increasingly sophisticated technology: Intranets and the Internet are now standard. Technology has been promoted as a means to overcome "distance" yet distance increases the difficulty of implementation, use and maintenance of technology. In "Workarounds and Security", Fiona Brady explores an example where the expectation and reality of the technology diverged, to identify different types of distance, and to trace some factors and choices that composed this situation. The article explores a short conversation about how to "workaround" the computer security in a remote indigenous council.

There are many potential benefits that remote Indigenous communities in Australia can gain from ICT, including increased employment opportunities, better service delivery, enhanced communication and support for cultural maintenance. Yet these people are currently severely disadvantaged with respect to ICT delivery. In her article "Remote Indigenous Australian Communities and ICT", Laurel Evelyn Dyson explores the issues which are critical in limiting these communities' access to ICT and critiques the Australian government's strategy to overcome these problems, which to date has largely focused on improving ICT infrastructure and has ignored many of the social, educational and cultural issues.

In her article "ICT for Social and Cultural Capital in Pacific Island Communities", Usha Sundar Harris explores the potential value of the Internet for community development and cultural participation in Pacific Island communities. She presents a case study of Internet development in Fiji, focusing on the current technological condition, impediments and milestones, and the potential use of the Internet by local communities. In his article "ITC Policy and Practice in the

Fiji Islands", Graham Hassall outlines how the need to consider both national and regional development has impacted on ICT utilization and policy in Fiji. The article also considers the "Pacific Plan"—a "digital strategy" to maximise cooperation in the development ICT initiatives for the Pacific region. The article "Impact of PFnet Services on Sustainable Rural Development" by Anand Chand and David Leeming examines the role of People First Network (PFnet) services in enhancing information and communication and contributing to sustainable rural development in Solomon Islands. More specifically, the article examines two main issues. First, it examines the uptake and appropriation of PFnet services by rural Solomon Islanders. Second, it examines the impact of PFnet services on sustainable rural development.

TOPIC 4: METHODOLOGIES

This section comprises articles that provide practical advice on methodologies for the research and development of the social, economic and cultural capital in regional communities.

Giacomo Rambaldi in the article "Participatory 3D Modelling" analyses the applications of Participatory 3D Modelling (P3DM), a community-based mapping method used to bridge the gap existing between externally supported geographic information systems (GIS), and capacities found among marginalised, isolated and resource dependant communities.

Lynne H. De Weaver examines the complex process of applying for grants in her article "Applying for Government Grants for ICT in Australia". Sustainability, scalability and reproducibility are criteria essential to the successful widespread proliferation of the Internet through schools-based community training centres in developing countries. In his article "Schools-Based Community Networking in Uganda", Daniel Stern presents strategies used in a schools project in Uganda that seem to meet those criteria.

Implementing new business models to achieve competitive advantage in the techno-economic innovation paradigm bring to the fore ICT adoption, strategic planning and network issues. In "Action Research Methods", Patrice Braun builds on the concept that global positioning and competitive advantage for small and medium size enterprises (SMEs) may be achieved through connectivity and clustering, and discusses research into the adoption of networked technologies by SMEs.

The lack of research and research models relating to the impact of ICT on sustainable development, generally, and more specifically relating to African rural women, has been noted by a number of sources. In her article "South African Women's Rural Development and E-Commerce", Jo Rhodes addresses the current void through contributing to the qualitative research body of knowledge. It charts the process taken to construct an ethical, qualitative research model with which to investigate decision makers' perceptual understanding of marketing and e-commerce relating to trading activities within a South African rural women's organisation.

The transformations of ethnographic practice that may result from collaborative Web-based and Web-oriented ethnographic research can be summarized as a series of moves from participant observation to creative observation, from field entry to field creation, and from research with informants to research with correspondents and partners. In "Web Site Development in Action Research", Maximilian C. Forte pays attention to the process of Website development itself as a research method with its own specificities and its own ethical considerations, thereby addressing a gap in the literature on collaborative ethnography and action.

Sociocultural Animation is a way of mobilising the social and cultural participation of individuals and community members so that they become actively engaged in their personal development and in the development of their community. In his article "Sociocultural Animation", Marcus Foth unpacks the social, cultural and educational dimensions that make up the foundation of sociocultural animation, and briefly describes some of the underlying principles and how they can be applied in the context of community informatics and developing regional communities with ICT.

TOPIC 5: TECHNOLOGIES

This section comprises articles that provide practical advice on the use of ICT to develop the social, economic and cultural capital in regional communities. The articles describe various technologies for building communities, including: voice-over-IP, satellite, open source software, radio and digital libraries.

Jiankun Hu gives an "Mobile Ad Hoc Networks", providing a historical overview on the evolution of network technologies starting from conventional circuit switching networks to data switching Internet, and then discussing the

existing data network technologies as well as emerging mobile networking technologies. Savvas Papagiannidis, Joanna Berry and Feng Li discuss "Potential Implications of IPv6 for Regional Development" and provide an analysis of the implications that this new technology may have for more the well-established medium of television broadcasting. In "Voice Over IP for Rural Telecommunication Provision", Thomas Wilsdon and Jill Slay provide a review of the technical and legal issues raised in the use of a wireless Voice over IP solution for rural telecommunication provision.

Wireless technologies, in particular, have a number of features which make them the best candidate for developing countries wanting to create a communications infrastructure at low costs and in a short time frame. In the article "Innovation in Wireless Technologies" Diego Ragazzi the multiplicity of heterogeneous wireless technologies that have been designed and deployed, to better fulfill specific user needs in different scenarios. In "Satellite Technology in Schools", Anneleen Cosemans gives an account of the SchoolSat trial—a 14 month project that interconnected nine schools in County Donegal, a remote and rural region in the north-west of Ireland. She describes the objectives and motives of the project, the phases, the participants and the technology used.

Patrick Craddock and Peggy Duncan, in their article "Radio for Social Development", explore how radio is a strong and effective teaching tool if it is supported by other educational inputs using theatre, print and other media educational tools. By giving an overview of radio usage for education in several countries of Africa and the South Pacific, the article shows how structured information presented in an Entertainment-Education radio format reaches, holds the attention of and educates rural audiences.

The last decade has witnessed the evolution of a number of technologies which have proven to be a boon to the visually impaired. In "Modern Tools and Technologies for the Visually Impaired", Anirban Lahiri and Anupam Basu discusses some of these technologies and also aims to explain the significance and use of such innovations to the visually impaired user.

Digital libraries offer significant selections of books, journal articles, photographs and similar documents, selected from the collections of libraries, archives, historical and cultural associations. Maria F. Trujillo, in her article "Digital Libraries and Development for the Illiterate", discusses how digital libraries software provides a unique opportunity to bridge the various divides: literacy, digital and social. The article outlines a future in which an icon-based (iconic) digital library would not only be fully searchable by an illiterate user without the use of text, but could also be used to train communities in disaster preparedness. In his article "Digital Library Structure and Software", Cavan McCarthy discusses the treatment of both images and text in typical digital library contexts, and the specialized digital library software that is now commonly used.

In "Free/Libre Open Source Software for Bridging the Digital Divide", Yu-Wei Lin argues that FLOSS helps developing regional communities by improving ICT capacity and empowering users. Given the shared code that can be used, copied, studied and modified and redistributed by users freely, FLOSS not only reduces the development costs, but also provides the opportunity to fix a bug or customise a programme for local users' own requirements. However, the author also argues that, while FLOSS could be a silver bullet for bridging the digital divide, the relationship between the ICT expertise and the local cultures should be examined more carefully in order not to lose sight of a symmetrical development. Jean-Philippe Rennard moves the debate from open source to open access resources in his article "Producing and Sharing Free Advanced Scientific and Technological Knowledge Using the Internet". He points out that, given rising journal costs, even the wealthiest institutions often cannot afford access to many important scholarly publications, and universities in developing countries are inevitably cut off from recent knowledge. His article discusses the emerging economic model of open access, to show that it can contribute to narrow the scientific information gap between North and South. It also presents ways to access this information and tools to develop regional scientific information sharing systems.

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Action Research Methods

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INTRODUCTION

To date, most research into the implications of the Internet for SMEs has focused on individual business barriers to ICT and e-commerce adoption. Such research has shown that SMEs tend to be time- and resource-poor, with their size being their main disadvantage vis-à-vis ICT adoption (OECD, 2000; Van Beveren & Thompson, 2002). Perhaps the question is not whether small firms have adopted ICT, but rather where are small firms in terms of their ICT adoption. ICT encompasses a series of separate yet inter-related components; for example, electronic mail (e-mail), the Internet, the Web, and e-commerce, which can be adopted in a variety of social and business settings. Hence, it is suggested that ICT cannot be considered as a single technological innovation but rather as a series of (process) innovations, potentially resulting in variable ICT adoption patterns (Walczuch, Van Braven, & Lundgren, 2000).

Keeping up with rapidly changing ICT trends and moving ahead with the adoption of the various ICT components is a challenge for all firms but may be particularly confronting for resource- and time-poor SMEs (Earl, 2000). To counter this phenomenon, a SME aggregation or cluster argument may be made for the use of ICT to develop joint e-marketing and e-commerce economies of scale (Braun, 2002). In the context of emerging technologies and related knowledge-economy business models, linking stakeholders in dynamic clusters is believed to enhance competition and regional innovation (OECD, 2000). Indeed, the literature is saturated with views on geographic proximity, or clustering of industries and companies, to create innovation and competitive advantage (Asheim, 2001; Porter, 1990).

The geographic scope of a cluster can vary from a single city, state, or region to a network of companies across state borders or even country borders. They can be formal or informal, in the public or private sector, horizontal or vertical, or physical as well as virtual (in an online environment). In a horizontal network, companies within the same industry sector might share an industrial or technological base, operate within a common market, and use a common purchasing or distribution channel. Vertical networks include horizontal cluster participants, as well as suppliers, users, and related services. Porter discusses competitive advantage as being "created and

sustained through a highly localized process" (Porter, 1990, p. 19) and ascribes enduring competitive advantage in a global economy to local knowledge, relationships, and motivation that cannot be duplicated by global partnering (Porter, 1998).

Connectivity has boosted conventional reasons for interfirm networking and virtual clustering—for example, by creating critical mass online—as it facilitates the knowledge-based infrastructure network imperative for today's competitive advantage. While a number of recent studies have shown benefits in physical SME clustering (Enright & Roberts, 2001; Lowe & Berrisford, 2002), notable research on ICT adoption in a virtual clustering context and studies on network use of the Internet as a cooperative e-commerce tool remain in their infancy.

Building on the concept that global positioning and competitive advantage for SMEs may be achieved through connectivity and clustering, this article first explores the conditions for small business network formation underpinned by technology, then presents the results of an action research study with a regional Australian SME tourism network seeking to establish a virtual e-marketing and e-commerce portal environment.

SMALL BUSINESS NETWORKS

Implementing new business models to achieve competitive advantage in the techno-economic innovation paradigm bring to the fore ICT adoption, strategic planning, and network issues.

Research into the adoption of networked technologies by SMEs indicates that the adoption of network structures and networked technologies by SMEs is generally related to the size and nature of SMEs and largely depends on their perception of affordability and business growth opportunities for their business (OECD, 2000). SMEs generally approach clustering and networked infrastructures such as the Internet with caution and hesitate to invest their time and money in a rapidly changing economy. SMEs do not necessarily view the Internet as a vehicle to transform their individual business capability from a parochial to a networked or global level, which may be achieved through the setup of electronic commerce (e-commerce) portals or other Web-enabled cluster structures (Murray & Trefts, 2000). The latter study cites lack

of technology skills, lack of a strategic sense of how to move forward, and fear of competitor use of the Internet as significant barriers for uptake of networked technologies by SMEs. Therefore, creating network infrastructures and collaboration between small firms is contingent not only on adoption of ICT technology, but also on economic and social contexts.

European studies on SME positioning in the networked economy point to SME's networking as being contingent on favorable economic conditions, for example, by providing government-sponsored external networks (Cooke & Wills, 1999).

An Asian study similarly provides empirical evidence that successful SME collaboration needs to be underpinned by resources that provide SMEs with the tools to become global players (Konstadakopulos, 2000). The European studies on SME positioning in the networked economy also associate social relationships with enhanced business, knowledge, and innovation performance (Cooke & Wills, 1999). While connectivity through public or private initiatives may facilitate the electronic linking of SMEs to one another for potential business-to-business (B2B) resource and transaction sharing, and help to reduce isolation of individual SMEs, there is another critical factor to consider in terms of network building between SMEs, namely trust.

Trust is an attribute not only of organizations but also of communities, industry networks, or even entire geographic regions, which can help expedite economic development and facilitate large-scale economic activities (Fukuyama, 1995). Trust between network partners is said to reduce fear of opportunistic behavior and improve collective learning and knowledge sharing. The trust may be historical and already exist between different firms, as illustrated above, or it can be built during the relational exchange (Gulati, 1995). Some scholars argue that relationships do not necessarily have to be based on trust, as long as systemic mechanisms are in place that allow stakeholders to have confidence that network partners will exhibit cooperative rather than opportunistic behavior and not take competitive advantage of knowledge-based exchanges (Das & Teng, 1997). In the aforementioned Asian example, SME collaboration was in fact taking place based on prior existence of trust and in an atmosphere of continued trust building between stakeholders (Konstadakopulos, 2000).

In summary, SME (virtual) clustering seems contingent on favorable network conditions such as connectivity (infrastructure), network relationships, and trust. ICT and related capabilities, such as virtual business network environments, can potentially have a significant impact on how interorganizational relationships are developed. Conversely, the structure and culture of an existing network of firms can have considerable influence on the way

in which the telecommunications network is developed, implemented, and used.

CASE STUDY

An action research study with a regional Australian SME tourism network seeking to adopt ICT and e-commerce provides some practical insights into network-based ICT and e-commerce adoption. Action research (AR) is a methodology and intervention process that is collaborative in nature, as it aims to work *with* stakeholders rather then *on* them (Reason & Bradbury, 2001). All action-oriented interventions value some form of participation, although there are varying degrees of collaboration depending on the method of invention. The participatory and action-oriented nature of action research is particularly suited to technological innovation, such as the adoption of ICT and portal technology, as it is flexible enough to meet the emerging issues of technology-related change.

In the pursuit of introducing ICT-related change in the tourism network, AR was found to be particularly suited to ICT-related organizational change, as it enables inquiry into and integration of the technical, economic, organizational, human, and cultural aspects of the intervention. AR-type consultations typically include a cyclical and action-oriented design that includes a diagnostic phase, a planning phase, a taking-action phase, and an evaluation phase. Apart from its cyclical approach and practicality, AR is generally appropriate when a project relates to "an unfolding series of actions over time in a given group, community or organisation" (Coughlan & Coghlan, 2002, p. 227).

The AR intervention ensued from a portal development consultancy with a geographically dispersed regional tourism network in the state of Victoria, Australia. Tourism network formation in the form of cooperative destination marketing has been in place in Victoria since 1993 as part of the state's strategic direction to develop integrated marketing campaigns for its product regions and to attain competitive advantage through collaboration (Tourism Victoria, 1993). Each product region has a so-called campaign committee, a voluntary organization made up of representatives from local industry and local government. Campaign committees are responsible for the marketing of the product region and the maintaining of communications with industry stakeholders in their region.

The AR project was undertaken with one such campaign committee, the Grampians Campaign Committee ("the Committee"), seeking to extend its traditional marketing media range and upgrade its basic ICT network to include an online marketing and transaction presence.

The Grampians are considered one of Australia's renowned tourism attractions, drawing in excess of 1.2 million visitors annually. The region encompasses some 900 tourism SMEs, seven major townships, numerous villages, and seven local government shires.

The brief was to design a portal model that would support business-to-consumer (B2C) marketing and e-commerce transaction efficiencies and serve as an inter-firm B2B interaction and knowledge-creation platform for tourism SMEs in the product region. The AR intent was to ensure that an appropriate portal model would be implemented that reflected stakeholder interests and portal needs. Although AR is an emergent process, and designing such a process is often considered incongruous with the nature of the intervention (Van Beinum, 1999), an overarching portal development approach was nonetheless adopted to provide starting conditions for the process, whereby the intention was to involve as many portal stakeholders as possible in the portal design process. The AR actions proposed to regional stakeholders were to:

- Take part of a data-gathering phase and collect stakeholder e-commerce inquiries and portal needs prior to the design phase of the portal
- Participate in a one-day forum to collectively formulate an initial e-commerce model for the product region
- Take part in follow-up communication to finalize the portal model

Interaction occurred between mid-2001 and early 2002 with a group of 20 stakeholders, who were either part of the Committee, representing tourism industry SMEs, or had a direct industry interest in the portal. After the completion of the AR intervention, all electronically available data — such as e-mail messages, audiotaped conversations, field and journal notes, ICT and tourism policy documents, speeches, and other pertinent documentation—collected during the course of the intervention were aggregated into a qualitative software program for data analysis.

STUDY RESULTS

In conducting and tracking the AR process of developing a product region portal, study results indicate that embracing portal technology is a complex and phase-based process. While e-mail had become the standard communication method for internal Committee business, it had not yet ubiquitously been adopted as the external mode of communication with SME stakeholders across the product region. The AR study indicated that both the hard technology (the telecommunications infrastructure that underpins the uptake of ICT) and the soft technology (the formal and informal skills and knowledge required for the uptake of ICT) remained inadequate. Contextual factors, many in existence prior to ICT adoption, such as stakeholders possessing (access to) ICT knowledge, infrastructure, skills, and time, played a significant role in portal adoption patterns across the product region.

Overall, stakeholders lacked both time and strategic vision, which resulted in a low level of participation in the AR process and lack of "ownership" of the portal. In examining connectivity through conversation and e-mail traffic analysis, it became apparent that institutional stakeholders (e.g., those with work-related access to network infrastructure) were markedly more "connected" than industry (SME) stakeholders. While many product region stakeholders were aware of the Web, the study indicates that most SMEs had not yet progressed to the e-commerce phase, confirming that adopting e-business technologies is indeed an evolutionary process that requires the negotiation of a journey that involves continuous learning and change. Adoption of the entire cluster of ICT technologies could, hence, be viewed as a linear process along an adoption continuum (Figure 1). After adopting e-mail, the Web is the second step for adoption consideration; e-commerce is the third step. This is then potentially followed by adoption of a complete e-business model, at which point we might speak of complete ICT adoption or an ICT paradigm shift.

Figure 1. ICT adoption continuum

3
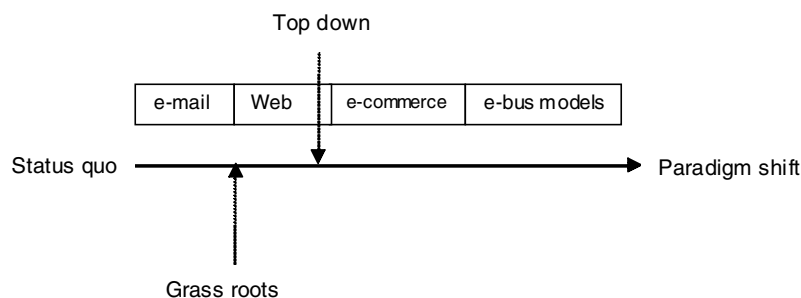
In further considering the SME approach to portal adoption within the network, the study suggests a strong relationship between portal development and network makeup, both in terms of place, e.g., stakeholder position in the network, and space, e.g., the geographic makeup of the network. The Grampians history and the vast boundaries of the Grampians product proved to be pivotal factors negatively influencing ICT network cohesion and SME interest in, and engagement with, the portal. The latter, in turn, influenced the scope of portal adoption within the product region and the SME approach to virtual clustering to achieve economies of scale.

On the whole, clustering was regarded as an interesting but far-fetched idea. Despite the Committee's interest in aggregating domain stakeholders, communication strategies or incentives to create industry awareness of clustering were not part of the product region's vision or strategic plan. Grampians SMEs were generally still too new to the virtual world to understand the relevance of clustering for their own small business, let alone as a crucial economic strategy for their product region. Because e-commerce was still beyond most Grampians SMEs' level of ICT adoption, the aggregation of SMEs in a virtual cluster or any other potential value added that might have been established along the regional value chain remained unrecognized and, hence, untapped. The specially designed industry clustering tier in the portal was not conducive to augmenting ICT adoption or to fostering an SME cluster culture.

The Grampians' reluctance to cluster may be attributable to various causes. First, the Grampians product region may have been too vast, with SME firms being too geographically dispersed to maintain relationships with and build trust between firms. Second, ICT alone could not permeate subregional barriers or initiate an inclusive virtual cluster culture. As other SME network research has indicated, network conditions need to be conducive to clustering.

CONCLUSION

ICT and related capabilities such as virtual business network environments can have a significant impact on competitive advantage in the networked economy. However, as this article has demonstrated, embracing the cluster of ICT technologies, including portal technology, is a complex and phase-based process. Many SMEs are not yet aware of the potential and value of collaborative e-commerce structures. Merely adding ICT and e-commerce capability to a network structure does not necessarily change or increase SME interest in virtual clustering. For SMEs to take mental, physical, and virtual possession of a shared ICT domain, they will need to get

comfortable with ICT and better understand the value of virtual clustering in terms of competitive advantage and economies of scale.

Becoming a network stakeholder may entail an enormous conceptual leap into the future for many SMEs. Network novices will need substantial encouragement and support to make them willing to take the network plunge (Braun, 2002). Creating awareness of networked opportunities, developing skills in using networked technologies, and increasing SME understanding of the potential of (virtual) cluster environments may be helpful. When favorable network conditions are present, participation in an SME virtual cluster is likely to produce economically beneficial outcomes.

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KEY TERMS

AR: Action research. Action research is an action-oriented methodology or intervention process that is collaborative in nature. It aims to work *with* stakeholders.

B2B: Business-to-business trading; involves the sale of goods or services by a business to another business.

B2C: Business-to-consumer trading; involves the sale of goods or services by a business directly to individual customers.

Cluster: A group of linked enterprises that share a common purpose of gaining competitive advantage and economies of scale.

Competitive Advantage: A condition that enables companies to operate in a more efficient or higher-quality manner than the companies it competes with, and that results in financial benefits.

Connectivity: The ability to link to the Internet via a computer.

E-Commerce: Connection, electronic data exchange and transaction capability via the Internet.

Economies of Scale: This refers to the notion of increased efficiency for the production and/or marketing of goods/products by pooling or sharing resources.

ICT: Information and communication technologies; includes phone, fax, e-mail, the World Wide Web, and the Internet.

Portal: A Web site or service that provides access to a wide range of services.

SMEs: Small and medium size enterprises; refers to enterprises with a specific number of staff. A small size enterprise generally refers to firms with less than 20 employees.

Value Chain: A value chain is a string of diverse companies working together to create or satisfy market demand for a particular product or a bundle of products.

A

Adaptive Use of ICT in Response to Disintermediation

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INTRODUCTION: EVOLUTION OF THE WebMAIL SYSTEM

Traditionally, the Australian travel agency sector has operated as the premium intermediary in a relatively simple distribution chain that can be depicted as follows:

Product suppliers/ → Intermediaries → Consumers
wholesalers (essentially, travel agents) (tourists)
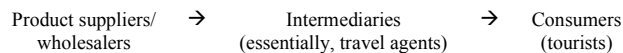
In such a system, it is estimated that travel agents have traditionally handled over 85% of consumer transactions (Wilde & Rosen, 2000). The advance of online technologies and ICT-based distribution systems has changed the dominant role of travel agents in the distribution and supply of travel products. This has impacted on their relevance, returns, and individual financial viability.

There is a vast amount of literature on new forms of product distribution made possible by developments in ICT. This literature has raised many issues (see, for example, Clemons & Hann, 1999; Klein, 2002; Anckar, 2003), but our comments are restricted to the concept of disintermediation and, in particular, to its application to the travel agency sector in the tourism industry (Anckar & Walden, 2002; Buhalis & Licata, 2002).

The key literature on disintermediation has been summarised by Anckar (2003) as follows: the threatened intermediaries (or disintermediation) hypothesis essentially describes the reduction or elimination of the role of the middleman in transactions between the producer and the customer, as in the new electronic marketplace, where consumers interact directly with producers. With the resulting bypass of intermediaries, which adds significant costs to the value chain, there could be shifts in power from one channel layer to another. Due to the presumed suitability of the tourist product for e-commerce and the fact that the travel distribution chain traditionally has been heavily dependent on middlemen, the travel industry has been hypothesized to be among the first sectors to experience disintermediation on a large scale as a result of ICT developments.

While there is voluminous theoretical literature, the empirical evidence of disintermediation in the international tourism industry is still patchy (Alamdari, 2002; Klein, 2002). In the United States, for example, while online transactions have grown dramatically, the overall industry impact in terms of market share has been significantly less than predicted—the evidence certainly does not support "travel agents are extinct" predictions (St. Clair, 2000). In Asia, a region with rapidly growing air travel, over 80% of all ticket sales are still made through travel agents (Alamdari, 2002). One can speculate that the drivers for disintermediation have not been as strong as expected, or that travel agents have been successful in their adaptive response, or as one writer (Klein, 2002) observed, "…the incumbents tend to fight back and leverage their financial power, their brands, established relationships, and click and mortar strategies" (p. 227). Consumer reluctance to use new technologies used for product distribution may also be a factor (Anckar & Walden, 2000; Alamdari, 2002), although more recent evidence indicates that substantial "conversion" might be underway (Anckar, 2003; Buhalis & Licata, 2002; Mowat, 2003).

We have noted that although travel agents still appear to have a substantial role in the industry, forces at work (including ICT impacts, e-ticketing, changes to commission arrangements, consolidation in the industry, etc.) have been working toward a significant diminution of that role. In this context, it is not important as to whether the debate is on disintermediation, reintermediation, or cybermediation, the impact on travel agents is generally negative. It is difficult to promote a scenario in which travel agents will become *more* important (Vasudavan & Standing, 2000; Klein, 2002).

This article discusses the development and implementation of the WebMAIL initiative as a response to the disintermediation of travel agents in Australia.

BACKGROUND

The Australian Federation of Travel Agents (AFTA) is the main industry body representing Australian travel agents. Its WebMAIL initiative is an Internet-based, business-to-business (B2B) system for the distribution and management of sales-related information covering "regular" travel and offerings products as well as "special" options. It is the only multisupplier, consolidated, product promotion database of its type in the country. WebMAIL provides suppliers with an Internet-based communication link to the Australian travel agency sector. It presents AFTA members with opportunities to embrace new technologies and to counter the threat of disintermediation. AFTA hopes that WebMAIL will reinforce the position of travel agencies in the distribution channels.

The WebMAIL tool is, in effect, a reintermediation of service provision. The initiative is a response by the sector's industry representative body rather than by the individual enterprises that comprise the sector. Also, while the technology underlying WebMAIL is relatively simple, its business model is self-funding in that the suppliers (the source of disintermediation and associated threats) fund the entire system. Initial success with this business model suggests that in Australia, at least, the travel agent sector can still add sufficient value to retain a viable role in the supply chain of travel and product services.

WebMAIL FUNCTIONALITY

Prior to the development of WebMAIL, individual suppliers of travel services contacted individual travel agencies by fax or by e-mail. In recent times, most travel service suppliers have also developed Web sites. Typically, a travel supplier would send information on various offerings to the travel agents in its distribution chain. Until the advent of WebMAIL, this information was generally stored in physical personal folders or in individually designed electronic folders. Effective use of such systems is heavily dependent upon individual skill and memory and has in-built difficulties with regard to currency, uniformity, and rapid ease of access. Clearly, with the continual emergence of more efficient electronic systems becoming widely available in workplaces and home environments in Australia, there was a need for a system that would better manage the information flow and for creation of a database that not only manages filing but contains an effective search and retrieval facility.

WebMAIL (Figure 1) collects and collates travel product and service offers from participating travel industry suppliers around Australia and compiles these with the individual user profile of each travel agent registered in the system. The system provides travel agents with one e-mail per day (usually at the start of the business day). WebMAIL supports this targeted communication with an automated filing and archiving system, along with simple-to-use search and retrieval functions.

Travel product and service suppliers can load information regarding their products and marketing initiatives directly into a central, searchable database. Suppliers also control when and to whom this information will be available. They stipulate the validity period for their information, and it is automatically removed from the "current" area upon expiry date. This reduces the chances of agents offering out-of-date information.

In addition to the notification by the "daily alert," travel agents can search for information in the WebMAIL database by supplier name, product type, information type, region, country, or date of issue. Hence, using

Figure 1. WebMAIL operations (simplified)
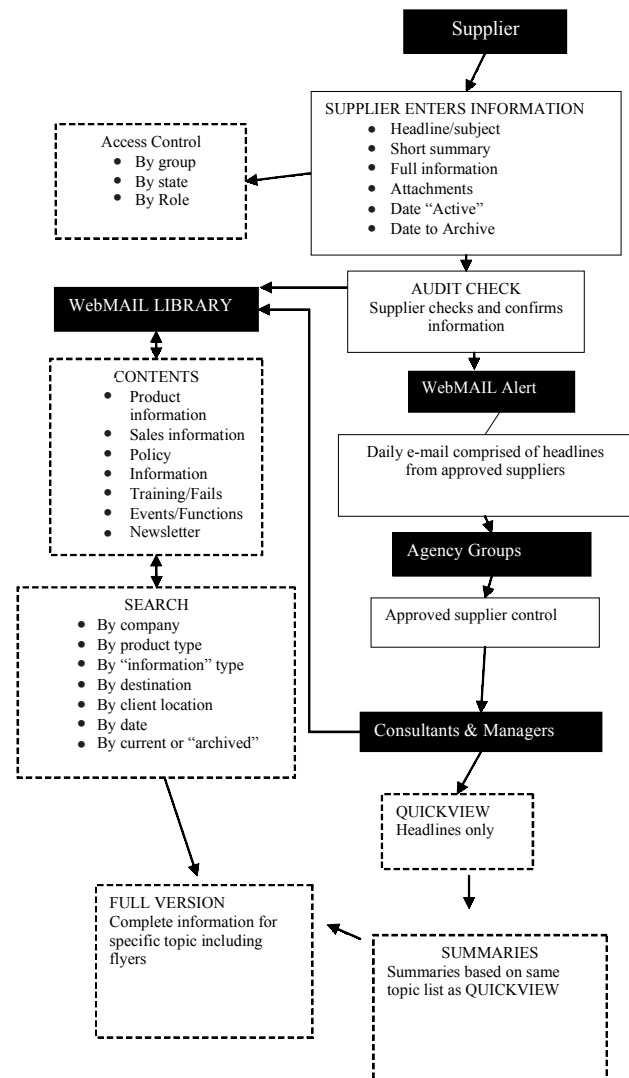
WebMAIL, suppliers are no longer reliant on agents trying to maintain their own filing systems for this information.

ICT-RELATED BENEFITS OF THE WebMAIL SYSTEM

Table 1 summarises some of the benefits that the WebMAIL technology has brought to the travel-agent sector.

POTENTIAL REGIONAL BENEFITS

The WebMAIL system may offer several benefits for regional travel agencies. Perhaps the main one is to effectively level out the availability of product information for all agencies, regardless of location. Importantly, it achieves this without requiring any extra financial outlay from individual agencies. WebMAIL opens up suites of product information and details previously inaccessible to re-

gional clients through their local agencies. The result is that, should it choose to, a small, low-turnover regional travel agency can access and obtain the same product information as its large, city-based counterparts.

The method of access to information through WebMAIL may also result in real savings for regional agencies. Prior to its inception, for example, regional agencies bore the costs of staff time and telecommunications access in obtaining up-to-date information about tourism products. Keeping in mind that regional travel agencies are generally small operations that are sometimes co-located with other retail outlets (for example, a news agent/travel agency business), these savings may prove to be significant.

In summary, WebMAIL can be described as friendly to small regional business, because it offers a low-cost and low-risk solution to obtaining up-to-date product information. It enhances the timeliness, quantity, and quality of information that is available to the enterprise so that a level information playing field is established for all travel agencies.

Table 1. The benefits of WebMAIL to suppliers and travel agents

WebMAIL Features	Benefits to Suppliers	Benefits to Travel Agents
Productivity and cost savings	• Suppliers can load product and marketing information directly into a central, searchable database. This greatly reduces costs of continuous and scattered fax and e-mail broadcasts.	• Travel agents no longer waste time searching for missing information they have misfiled. All supplier updates are on the database and can be easily searched and retrieved. • Business model whereby suppliers pay to have their information distributed, rather than the travel agents paying to receive that information.
Information management	• Provides automated filing and archiving, so supplier information is always available to agents. Links to supplier Web sites and booking portals can also be included. • Promotional documents like flyers can be attached for agents to download and supply direct to the customers.	• Receive one concise e-mail notification of all the latest updates from all suppliers each day. This greatly reduces the administrative burden in fax notifications, e-mail broadcasts, and all other forms of marketing directed by suppliers to agents. • Set their own profile for information to be tailored to their needs. This allows for the provision of superior service to potential clients. • Provides easy access to all past updates. Agents can quickly check the product information and advise both the customer and the supplier.
Product management and target marketing	• Suppliers can choose to send updates to all agents, or to specified groups only; to all consultants, or to managers only; and to all states or to specified states only. They can also choose when the information will be shown as "current" and when the information will be transferred to the "noncurrent" archive.	• Searches of all previous "alerts"/updates can be made in the AFTA WebMAIL database (see Figure 1).

RESULTS: WebMAIL IMPACTS

Since the introduction of WebMAIL in Australia in September 2002, more than 5800 travel agents now access the WebMAIL system, with 120 unique travel product and service suppliers subscribed as of September 2003. In this introductory 12-month period, over 4,000 product offer notices (many referring to multiple products) were lodged with WebMAIL; the site receives approximately 1000 unique visits from travel agents per day. In the January to March 2003 quarter, the Web site monitoring company Hitwise ranked *www.afta.com.au* number 7 in Australia in the Travel Agency category and number 5 in the Business & Finance—Professional Associations category. Responses to an online survey in September 2003 indicated a high level of satisfaction with WebMAIL.

CONCLUSION

The introduction of online technologies into travel and tourism distribution channels has had a substantial impact on the relationship between product suppliers and intermediaries. AFTA has responded to the threats created by the process of disintermediation with the WebMAIL ICT system. The WebMAIL initiative has enabled suppliers to realise substantial benefits in maintaining intermediary channels, including the capacity to enlist distribution mechanisms that are seen as largely independent and objective. Travel agents have benefited from reduced "information overload," while both groups have improved information management practices. Importantly, this ICT initiative may realise real benefits for travel agencies in regional areas.

One indicator of the success of WebMAIL has been the subscription of suppliers to the business model, whereby it is the suppliers who pay to have their information distributed, rather than the travel agents who pay to receive that information. This model has proven successful in the first year of WebMAIL's operation; however, the future of WebMAIL is undoubtedly in the hands of the suppliers. The challenge is for travel agents to continue to provide value for money for subscribing suppliers, and in this sense, WebMAIL represents one component of adaptive responses to potential disintermediation in Australia. Further research is required to identify what other components are required and how online technology may be employed more effectively.

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KEY TERMS

AFTA: The Australian Federation of Travel Agents. AFTA is the peak representative body for Australia's Travel Agents, representing the majority of travel agencies in Australia. Its aim is to "…stimulate, encourage and promote travel, and to uphold the interests of travel agents" (AFTA Web site: www.afta.com.au, 2004).

Disintermediation: Describes the reduction or elimination of the role the middlemen in transactions between the producer and the customer as, in new electronic marketplaces, consumers interact directly with producers.

WebMAIL: An online system developed by AFTA providing travel agencies in Australia with access to tourism product and service offerings from participating industry suppliers.

Analysing a Rural Community's Reception of ICT in Ghana

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INTRODUCTION

The *Fiankoma Project* was a development awareness (DA) initiative run by the Video Educational Trust aiming to link the small rural community of Fiankoma (Ghana) with people and institutions in Brighton UK through Information and Communication Technologies (ICT). People in both settings produced accounts of their lives using digital media that were turned into a Web site for cultural exchange and development education. A parallel research project *Understandings of education in an African village: The impact of information and communication technologies[1]* studied the effects of the intervention on the Ghanaian community, seeking to gain the perspective of rural Africans on ICT and development and particularly education. Ethnographic and participatory methods enabled the research to achieve an unusual perspective on these issues (Thomas & Ahmed, 2004; Chambers, 2003).

The research drew on data collected by Fiankoma Project workers as well as the mostly Ghanaian researchers in the *Understandings* team. "Data chains" were used to make more explicit the moves from field experience to textual outcomes. Visual material often formed the first link in the chain, prompting reflection on the issues of interest and a stimulus for dialogue in the shape of informal interviews. The chain was continued by discussions between insider and outsider researchers of the previous links, interpreting existing data, and generating narratives derived from researchers' experience and understandings of the context. This linked with other data to guide further lines of inquiry (see Pryor & Ampiah, 2004 for a full methodological discussion).

Fuller accounts focusing on educational issues in Ghana are published elsewhere (Pryor & Ampiah, 2003; Pryor, 2005, forthcoming). This article discusses ICT and development issues, reporting on attitudes before the intervention, describing the approach to using digital media and its effect on attitudes towards community development. This is analysed and placed within an emergent framework for considering how ICT use might impact beneficially on rural people in disadvantaged contexts.

BACKGROUND

Before intervention from the Fiankoma project, villagers had little experience of electronic media, but paradoxically these were having a profound effect. Inexperience was due to the remoteness of the village and its lack of electricity, in itself a point of contention. Some months previously the village elders had proclaimed a levy to bring electricity to village. Any sum of money is difficult to find in rural Africa, but the levy appeared to be well within people's capacity to pay. The researchers conducted a ranking exercise, which confirmed that most people in the village considered electricity to be the one thing that would most improve their lives and bring economic benefits. Nonetheless, many had refused to pay. Interview data suggested that reluctance to pay was due not to poverty, but because of the weak social fabric of the village. Fiankoma is not a community to which its occupants owe allegiance, but a settler community. People live there because from the 1930s onwards, they or their parents left their homes to carve out farms in the forest. Despite many years residence, people felt more connected to their places of origin. Their attitude towards the electricity fund was reflected in their reluctance to contribute to anything locally—including the schools that their children attended. Recent work suggests that this situation is common in Ghana and elsewhere in sub-Saharan Africa with rural-rural migration leading to less stable populations than has been thought the case (Litchfield & Waddington, 2003).

Villagers' most frequent encounter with electronic media was radio mainly used for music. FM reception was poor and AM output did not use the local language. This also confined TV viewing mainly to infrequent Akan language soap operas and soccer matches. In a village of some hundred households up to five TV sets were in use at any one time, run from car batteries that had to go by taxi to be recharged. Nonetheless, everyone watched TV occasionally, although few had any power over what and when. A traveling video showing Nigerian action-packed blockbusters, high on violence especially towards women, played to quite large audiences. During the project the village elders banned these shows, which were seen as corrupting the young, an action validated by

Leach, Fiscian, Kadzamira, Lemani, and Machankanja (2003) who report boys' claims elsewhere in Ghana that sexual molestation of girls took place "to practice things in films" (p. 37).

The village had no telephone, few people had used one, though they knew about them from television, and it was placed very low in the ranking exercise. Computers were unfamiliar, as they did not feature in televised dramas. Although the senior secondary school syllabus includes some "hands on" experience, the few students who attended reported that this had failed to materialize. Very few had heard of the Internet.

Attitudes and understandings are ultimately more important than hardware and infrastructure issues (Leonard & Dorsey, 1996). Villagers' reactions to the project's work yielded important insights about their image of ICT. It had been anticipated that understanding the purpose of the project and the notion of cultural exchange would be problematic, so much effort went into explanations. Nevertheless two misconceptions surfaced.

The first, that the project was to provide development aid, occurred throughout the fieldnotes and was dominant in interviews. Development and its outcomes are familiar concrete ideas, whereas cultural exchange is abstract and unfamiliar. Moreover the very idea of cultural exchange presupposes experiences of a cultural "other," which is difficult to grasp for people whose experience of other cultures is hazy. "*Obruni*" (strangers, white people) might be benevolent, but that they wished to learn from villagers was incomprehensible. Recognising a power differential between the two parties, where difference in wealth was a key distinguishing feature, good intentions could only be assured by some material benefit accruing from the exchange (Nelson & Wright, 1995).

Second, screenings of work in progress provoked worry about how the images might be used. Some felt that the "*Obruni* wanted to make a mockery of the inhabitants of the village."[2] Another view of malign intent, the idea from animist religion that Obruni would carry away people's spirits, may seem remote from the realities of modern technology, but in some respects it is close to the truth. The tourist gaze does not flatter developing countries, and affords no control to the subjects (Linnekin & Poyer, 1990). Images are created and removed from sight with no "come back." The "spirits" can be edited and used without reference to those portrayed. This "régime of representation" stereotypes the subjects, "classifies them according to a norm and constructs the excluded as 'other'" (Hall, 1999, p. 259). In global news media Africa is largely absent but when covered is usually seen negatively (Hawk, 1992) and Africans' poverty is explained "with reference to their own cultural lack" (Stevenson, 1999, p.138). The media's construction of Africa func-

tions to perpetuate feelings of Western superiority and provides legitimisation for existing relations of dominance (Borgartz, 2002). Until recently this issue only surfaced for Africans who migrated to the North. However, with the reach of media extended to remote villages, people are exposed to a romanticised picture of global culture, yet do not see their own realities reflected.

In summary, although people were passive consumers of electronic media on a very small scale, these were affecting their cultural attitudes. Television and video gave a window into a more sophisticated and attractive urban world, mostly the cities of West Africa (cf., Lewin, 2000; Hall, 1998). ICT development was at best irrelevant for most people. At worst it reinforced the divide between them and the urban elite.

Faced with these problems, the methods used by the Fiankoma Project are significant. A document was produced, spelling out the approach in the form of 12 rules (see www.fiankoma.org). The Fiankoma Method recognises that technology is less important than knowing what to do with it and conceptualises this in terms of enabling people to publish their own information and represent their own lives. The Web site was designed with its audience in mind, a process facilitated by having actual partners. A wide range of media, especially low tech, such as drawings and scrapbooks, enabled more people to participate actively. As far as possible, editorial responsibility was given to groups of people to help them explore cultural commonalities and differences. They were encouraged to respond to each other's contributions and find equivalence, so simple reproducible activities were favored. Humor and media conventions worked well and provided a safe context in which to look at problematic issues. Using ICT in development awareness required allocating time for making materials, viewing work from the other community and reflective discussion. The Web site was seen as something to be used rather than just created and the strategy for use included opportunities such as guest books, public events, and competitions.

EFFECT OF THE INTERVENTION ON ATTITUDES TOWARDS COMMUNITY DEVELOPMENT

When the Fiankoma project Web site was running, researchers returned to the village to collect more data and a group of villagers was taken to the city and introduced to computers. The session ended with browsing the Internet, especially the Fiankoma Web site.

Reactions were very positive, especially when people saw their village and themselves on the computer screen. The experience was intended to provoke thought about how computer technology might impact on their lives in

the longer term, but it was difficult to get them to think beyond the immediate experience. Issues of connectivity and access gave the experience a degree of unreality. Some expressed skepticism about the effect of computers, for example, that computers, though very exciting and useful, would emphasise the difference between urban and rural people. Others were more optimistic: a boy who had seen the Web site reversed his decision to drop out of school. The exchange value of school was heightened, as computers were the province of senior secondary school graduates and the use value of schooling via literacy was accentuated, since getting the most from the Web site depended on reading. ICT provided a window onto a world of opportunity, which was linked to education.

The Internet session also alleviated worries about the effect of the project's images. Visibility was now viewed positively: "Before no one knew I existed, now the whole world can see me."

Several months later, the Fiankoma project workers returned to share more UK work. A film was screened and two further Internet café visits staged. At the screenings most interest accrued from participants seeing themselves, especially activities where they had been most active in planning and authoring. The UK sections they were most positive about were those with strong points of connection to their own.

The Internet sessions were particularly targeted at teachers and older pupils. Teachers now recognised great educational potential in the Internet and that more access might enable Ghanaians to catch up, though this was unlikely as lack of resources would always put African countries at a disadvantage (c.f., "leapfrogging" and "marginalisation" in Yates (2002, p.6)).

However, the most dramatic effect of the Fiankoma project happened a few months later. A letter was received saying that the village had resurrected plans to raise money for electricity. The main engine for this was to be community action. The richest man in the village had donated land for a community farm and the village was organising communal labor. All profits were going towards electrification and the village was now seeking other ways of getting further contributions. The Fiankoma Project responded to this by offering to raise matching funds. Several harvests later sufficient money has been raised and at the time of writing electrification is expected imminently.

The extent to which the Fiankoma project caused this change in attitudes towards community development is obviously open to debate. However, available data suggest that villagers hold it responsible. Whereas previously lack of community spirit generated little "push" towards this development, interaction with ICTs seems to have exerted a strong enough "pull" to counter the lack of community spirit.

DISCUSSION

This was a case study of an unusual eventuality—a cultural exchange project. As such it is difficult to generalise and hard to reproduce these specific circumstances and interventions elsewhere. Moreover, it is difficult to compare its effect on village life with ICT for development projects elsewhere in sub-Saharan Africa. Project reports tend to focus on individual effects and community impact is either unreported or is speculative rather than evaluative in nature (Etta & Warnahui, 2003; Adeya, 2002). More important, this was not a development initiative but a cultural exchange project. Villagers had no expectation of computers coming to the village for a very long time, so they were not demanding electricity to browse the Internet. The key outcome was that the particular form of their interaction with ICT had helped to galvanise a village into taking collective action where there had been very little sense of community; and this testifies to the power of some of the practices used. Analysis of just what was so powerful about these practices may be useful in pointing to ways in which ICT development projects, especially those in rural Africa might conceptualise their work.

Before intervention, the impact of ICT on people in the village was negative, at best neutral. Radio, television and video appeared to have interrupted some traditional forms of communication, such as story telling. Video was associated with violent and sexually dubious messages, offensive to many adults in the village. Television was a window into a world of material plenty invoking invidious comparisons between urban and rural life and diminishing villagers' sense of dignity. Few could exercise power in their consumption of media, being reliant on neighbors' goodwill and limited by language. Rural people like them were infrequently portrayed and then in a negative way. Access to ICT was limited, passive and unmediated. They were sufficiently involved to be drawn into the periphery of the global media world, but the means of access and the nature of the texts only emphasised their sense of inferiority and exclusion.

By contrast, media access via the Fiankoma project, although still limited, was active/interactive and mediated. These features contributed to the ICT having a much more positive impact. In theorising this, the research identified three aspects that seem to have contributed to the change in attitudes:

- Recognition
- Association
- Appropriation

Recognition works in two ways. First, people were able to see people represented whose lifestyle they recognised. The effect might not be so extreme for people from other villages, but nevertheless, the sympathetic portrayal of "people like us" is a far cry both from glamorised views of urban society and the negative portrayal of village life otherwise available. It was recognisable because rural people had been actively involved in generating text, rather than just consuming it. Recognition also occurred in the sense that the villagers felt themselves recognised by outsiders and therefore distinguished by being portrayed.

By being on the Internet they experienced *association* by joining with a wider world. Although the Web site was not accessible in the village, the site was interactive and messages were passed on. Rich and poor can rub shoulders and talk to each other in cyber space and the Internet allowed people to communicate and associate as part of a prestigious global community.

Both recognition and association raised morale and enhanced dignity. Describing the village to a wider audience seems to have given people a sense of identity. A community that was not there before was called into being. This provided the "push," while the idea of the benefits of electrification furnished the "pull" to provoke this community into action.

Appropriation occurred through the active methodology of the Fiankoma project. People could develop skills and actively appropriate techniques only seen passively before, thus developing an enhanced understanding of how media worked. Producing materials via digital media is likely to demystify the process and make the producer a more critical consumer, enabling a meta-perspective and a deeper understanding. When people in the village were making the accounts of their lives, it was clear that they already possessed some media literacy as they used conventions such as those seen in Ghanaian soap opera, but those who took an active part in it had undoubtedly extended this literacy by the end of the project. Sayed (1998), in defining information literacy, identifies two aspects: first, narrow or specific notions, concentrating on mastery and understanding of IT; second, global definitions, emphasising access to, location and critical evaluation of information. Active methods such as those of the Fiankoma project put people in a good position to gain both aspects. Although most of what is available via digital technology fits more easily with fears about exploitation and mockery, enhanced knowledge to read what was going on and to see behind the techniques can only be positive in combating any sense of inferiority.

CONCLUSION

Much ICT development work has focused on issues of access and hardware. Optimists suggest that increased provision will empower disadvantaged communities (leapfrog) whereas pessimists argue that they will only ever get further behind (marginalisation). The work reported here suggests that whilst addressing issues of connectivity, it is important to think clearly about issues of text and representation. At a practical level the Fiankoma method provides clear guidelines for community developers using ICT and digital media, emphasising active skills such as authoring and editing rather than just passive skills of being able to move around the World Wide Web. At a more theoretical level, the three concepts of recognition, association and appropriation represent an emergent framework not only for analysing electronic media artifacts, but also for appraising the potential impact of development work with ICT, particularly with people in low-income countries and other marginalised groups.

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KEY TERMS

Appropriation: The idea that active exploration whilst creating their own texts enables people to appropriate the knowledge that will help them read other texts.

Association: The degree to which participation in global communication confers on participants some of the prestige associated with more glamorous lifestyles.

Development Awareness Projects: Projects aimed at promoted awareness and understanding of international development issues usually with people in high-income countries.

Fiankoma Method: An approach to community working with ICTs emphasising active authorship.

Leapfrogging: The notion that access to ICTs will enable people to skip over stages of technological and economic development.

Marginalisation: The idea that availability of ICTs will serve further to marginalise poor people.

Recognition: The extent to which digital media should both enable marginalised people to recognise themselves and their lifestyle and to feel recognised by their experiences with them.

ENDNOTES

[1] The two projects were funded by separate sections of the UK Department for International Development (DFID).

[2] Direct quotes from interviews such as this are literal translations from Twi.

Applying for Government Grants for ICT in Australia

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BACKGROUND

The legend on the CTC@NSW Web site, http://www.ctc.nsw.gov.au/about/, defines Community Technology Centres (CTCs) as "computer enabled multi-purpose facilities based in the Main Street or main centre of a town. They provide access to Internet-connected computers as well as provide printers, video and teleconferencing facilities, business equipment, and e-commerce incubator facilities. CTCs are owned and managed by a non-profit group, such as an incorporated association, co-operative, or local government committee. There are a number of titles that have been used to date to describe CTCs including Telecentres and Telecottages."

The CTC@NSW program was established to build capacity and deliver a range of nominated services to communities with populations of less than 3,000 through the use of information and communications technologies (ICTs). Each applicant community had to develop its own business plan to meet the identified needs of their community. Successful applicants received grants of between $150,000 and $200,000. These funds were to be used as seed money to establish a community owned and operated business.

The NSW State Government and Commonwealth Government jointly funded this program to run from early 2000 to June 30, 2004. During this period, over 60 new Community Technology Centres (CTCs) were funded in small, regional communities throughout NSW. Unfortunately, towards the conclusion of the funding period, those communities who had been funded in later rounds had to do without the support, resources and assistance provided by the CTC@NSW Support Unit because the funding for this part of the program concluded on June 30th. Only the CTCs that had been funded in earlier rounds would be the full beneficiaries of this aspect of the program.

In order to be eligible for funding under the CTC@NSW program, interested communities had to first complete an Expression of Interest and demonstrate that they met the program's specific eligibility criteria. If they made it through this "hoop," they then had to complete a complex application form, which required them to develop a comprehensive business plan, which included technology and marketing plans in addition to annual cash-flow projections for the first three years of operation. Applicant communities had to demonstrate how they could establish and maintain viable businesses within their communities during the three-year period of funding as well as how they planned to make their CTC viable after all grant funding had been expended.

However, it was through working on the CTC@NSW program, as well as several other ICT programs, that the author came to grips with many of the issues that make economic development in regional Australia so problematic. Her findings were, in many ways, similar to those of Wolstenhome's (1995) who stated, "The continued application of inappropriate models may arise out of difficulties in communication between government representatives and members of community groups during the consultation and planning process. Such difficulties may be due to a lack of understanding about the ways in which rural communities work" (p.1). In particular, some of the difficulties with communications were often exacerbated by the bureaucratic language used in the information packs supplied by the funding bodies as well as in the actual applications themselves.

While it is perhaps easier to have a relatively esoteric discussion about regional economic development, perhaps the single most important asset that is often overlooked or marginalized in these discussions, is the people who actually live and work in regional communities *and* apply for grant funding. It is important to note that while the levels of formal education of these people may not be as high as those living in major urban centres, this does not mean they are not as capable of successfully administering grant funds, but rather they are not familiar, or comfortable with, the phraseology and business-oriented buzzwords that proliferate in the documentation of government funding programs.

Shepherd (1998) noted that, "Rural development, like other creatures of the 'development industry'…is prone to jargon and the extensive use of buzzwords. Sustainable development, sustainable agriculture, participation, women's involvement, indigenous knowledge, integration, are all examples of phrases which are uttered ritualistically when the need arises" (p. 19).

It is also worth noting that during the period of time the author worked with small communities in the Northern Rivers to help them gain access to a range of ICT services, she drew many of the same conclusions about the nature of the people who lived in regional communities as did Plowman, Ashkanasy, Gardner, and Letts (2003). They stated, "Innovative towns were perceived to have these characteristics in greater abundance: administrative and managerial capacity to run and promote the town…availability of a variety of experts to provide the breadth of services that the residents expected…managerial attitude towards change…a higher proportion of residents who had lived elsewhere, a higher proportion of residents working in the so-called creative-class" (p. 2).

Over the course of her work with regional communities, the author developed a methodology for the process of applying for grant funding which helped to increase the "success rate" for applicant communities. This is not to say that all of the communities and grant applications she worked with were successful, but rather the communities that used this methodology, and had more of the characteristics mentioned earlier, tended to be more successful with their applications for funding.

A STAGED APPROACH TO THE TASK

Stage 1: Getting Started

In order to better understand the nature of the grant for which they were applying, communities first had to determine:

- Who is offering the grant, e.g., the State or the Federal Government?
- What does the government expect to achieve through offering the grant?
- What is the grant expected to achieve for the applicant communities, e.g., what are the expected outcomes?
- Which region(s) is the grant supposed to benefit?
- Is there a time span involved? (Many government grants have specific periods of availability, e.g., funding rounds as well as closing dates.)

Communities also had to consider that there may be political implications or other issues regarding the particular program for which they were applying. They also needed to look at it from the government's perspective because in their eyes, a successful grant program is expected to generate a high level of interest from potential applicants. This means that government agencies actively seek to encourage as many applications as possible in the belief that this will help them direct their funds to the most promising projects. (It is worth noting, that the most deserving communities might not be the ones most able to prepare and submit the "best" application.) Additionally, applicant communities must make sure that their funding objectives match those of the grant program's so that the collective time and energy of the people involved in the process isn't wasted.

However, the first step in the process is to acquire the program's information pack and read it carefully. Much of this information is also available on the relevant agencies' Web site, http:// www.grantslink.gov.au, is an excellent reference site for communities to explore as it takes a whole-of-government approach to funding.

Good "grant information packs" should be comprehensive and include such things as:

- A clear statement of the funding program's objectives;
- A list of the criteria against which the application will be assessed;
- Information regarding the supporting documentation that might be required;
- The contact details of the people who may be able to assist communities with their applications;
- Information regarding any other resources that might be available;
- Any specifics that pertain to a particular program; and
- Information as to the number of funding rounds and their closing dates or, if it's a one off program, the actual closing date.

Applicant communities also need to be aware that government-funding programs are usually created in response to policy decisions and often focus on a particular issue or range of issues that the government of the day has decided to address. Applicant communities must determine, at the very onset of the process, whether some of the funding program's objectives or criteria have greater weight than others. This is often the case in regional Australia, and that's why it is a good idea to establish a good working relationship with the program's administrators.

Jargon and three letter acronyms (TLAs) are often the hallmark of grant programs and applicant communities need to familiarize themselves with the "language of the grant" before proceeding. They also need to understand all of the requirements at each step in the

process, e.g., an initial Expression of Interest (EOI) to determine eligibility, the application itself, regular progress reports, Memorandums of Understanding (MOUs) from potential partners, and so forth.

While applicant communities must also build and maintain ongoing community support for their funding project, they must also determine who will be on the Grant Planning Committee. Having the right mix of skills on that committee plays a crucial role in achieving a positive outcome, and the importance of strategic partnerships cannot be under-estimated in achieving a successful outcome. If training is to be one of the services provided, then strategic alliances with like-minded organizations such as Adult & Community Education (ACE) programs, University of the Third Age (U3A) groups, local libraries, and so forth, cannot be under-estimated in terms of the skills and experience they can provide. The planning committee also needs to include representatives from all the key stakeholder groups in the community and have a chairperson who is well-respected and networked in the community.

Finally, members of this committee must possess the range of skills required to successfully complete the application. The capacity of the committee to prepare marketing plans, spread sheets and understand accounting or bookkeeping procedures and software applications is essential for achieving a successful outcome. Last but not least, a good planning committee needs to maintain community interest and support through ongoing public relations activities.

Stage 2: Meetings and the Application Process

All successful communities had strong committees that held regular and productive meetings. These meetings were productive because the committees were committed to the proposition that good meetings led to good outcomes. These committees would:

- Set agendas and stick to them;
- Use the application as their reference point;
- Determine priorities, e.g., what needed to be done and in what order;
- Determine which tasks could be done concurrently;
- Appoint sub-committees as required BUT make sure they reported back to the entire committee;
- Assign tasks or set homework;
- Set timelines and met deadlines;
- Establish a communications procedure, e.g., who is going to keep the minutes at meetings and who will distribute them; and

- Set times, dates and venues for subsequent meetings as far in advance as possible.

Stage 3: Finding Out How to Find Out

Grant applications include a range of questions that need to be addressed so that the funding body can determine need and eligibility. The committee must therefore address all of the criteria for the grant for which they are applying and complete all sections as comprehensively as possible. This means they have to:

1. Identify their critical reference group and understand its needs;
2. Determine what they really need to find out;
3. Test/challenge assumptions they may have about their communities;
4. Identify the questions on the application that need substantive, well-researched answers;
5. Develop a strategy for getting the answers, e.g., written surveys, public meetings, focus groups, services audit, telephone surveys, traffic counts, interviews, etc.;
6. Determine other factors that might be impacting on their community, e.g., conflicts, service overlaps, other issues on the front burner;
7. Analyze and discuss their "research" findings at meetings and prepare concise reports supported by facts and figures;
8. Build ongoing community support for the project; and
9. Communicate—keep everyone in the loop.

While point three might seem unnecessary, one of the communities that planned to apply for a CTC@NSW grant wasted a considerable amount of time due to lack of knowledge about their community. They had originally decided that their primary target population would be seniors. But when they finally conducted their research, they were surprised to find out that this group was particularly well served in the community as there was a Seniors' Computer Club, free Internet access at the Public Library and the U3A had recently established a branch and were planning to offer a computer and Internet training program.

While there are many ways to gather information, each community must devise the strategies they need to employ in order to gather the type of information required for the particular grant for which they are applying. If surveys are undertaken, then the questions need to be as unambiguous as possible and key demographic information captured. Short surveys are much easier to prepare, undertake and analyze.

Conducting a community survey can be a discrete task undertaken over a designated period of time. However, in order to be effective, the preparation work required for that survey must be thorough and comprehensive, as it requires solid intellectual and physical input in order to provide convincing evidence or data, to support the community's application, e.g., all projected user groups for the proposed CTC facility must be included in the survey. The planning committee must decide who needs to be surveyed, what type of questions need to asked and how many responses are required to yield a statistically relevant level of response, e.g., their sample size. It is also important to ensure that the questions in the survey are written to support an application rather than as promises of things to come.

It is both practical as well as advisable, to approach other people in the community to assist in conducting a survey, as they may be very interested in the project, but don't have the time to be on a planning committee. Assisting with the application process in this way also helps to generate greater community "buy-in".

Often the results of a community survey make an interesting story for the local newspaper and this is another good way to keep the community informed. Once the survey information has been collected and analyzed, it's time to actually start completing the application, which leads to Stage 4 of the process.

Stage 4: Preparing and Submitting the Grant Application

In order to complete and submit an application, the planning committee will need to:

- Allow sufficient time for the task because applying for a grant *does* take time;
- Include as much supporting documentation as possible, e.g., if you state in the application that public transport is limited, include evidence, bus schedules, ABS statistics on car ownership, etc.;
- Answer all questions in each section carefully and accurately;
- Pay attention to detail;
- Make sure the application demonstrates that the community has the management capability to take on the project;
- Comply with all presentation and submission requirements, e.g., soft copy on disk and two bound hard copies, etc.;
- See if someone from the grant program can "preview" the application before it is officially lodged as they might be able to make some additional suggestions to strengthen it;

- Make a copy of the completed application, including all attachments, for the committee's records; and
- Meet all deadlines.

Once the application has been submitted, it is important to continue to manage the community's expectation. The planning committee, as well as the community, must remember that just because they have put in the time and effort, there is no guarantee of a favorable outcome.

CONCLUSION

A great deal of community consultation and business planning is required in the application process. The skills of the people on the planning committee are crucial to achieving a favourable outcome. Some of the other key factors that emerged as determinants to the success of a community's application were:

- The capacity of the organizing committee to understand *all* of the requirements of the application;
- Their ability to articulate community needs;
- The business skills and financial acumen of the members of the planning committee;
- The community's commitment to the project for which they are seeking funds; and
- Their understanding of how ICTs could serve as a means of promoting economic development and building capacity in their communities.

Further research is being conducted to determine whether or not the communities that received CTC@NSW Grants have been able to achieve their goals.

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KEY TERMS

Australian Bureau of Statistics (ABS): ABS provides information to assist governments and communities with their research, planning and policy formulation. It houses Australia's largest statistical database, covering a wide range of economic, social and demographic information. The ABS Web site can be found at *http://www.abs.gov.au.*

Broadband: "Broadband" refers to a telecommunication service in which a "wide band" of frequencies is available to transmit information. When a wide band of frequencies is available to subscribers, information can be multiplexed and sent on many different frequencies or channels within the band concurrently. This means more information can be transmitted in a given amount of time, just as more lanes on a highway allow more cars to travel on it at the same time. As a general rule, the greater the bandwidth, the faster the service.

Demographics: Involves the statistical study of characteristics within any populations such as age, gender, marital status, address, occupation, mobility, health or disease rate, etc.

Grant, Tied Grant: A grant is generally a sum of money that is either paid in full or installments over the life of a particular project, while a tied grant stipulates particular conditions.

Target Population: A particular group within a larger group, about which the researchers are trying to generalise their study or research findings, e.g., seniors. Sometimes referred to as the Reference Group.

U3A: An educational organization with charitable status, where retired people from all walks of life, meet like-minded members to expand their knowledge, share interests or acquire new skills. Members usually offer a lifetime of experience, expertise or know-how in professions, occupations or hobbies and form study or activity groups to share their knowledge with fellow members. Although called a University, no academic qualifications are required or given. Those who teach are also those who learn.

Wireless Local Loop (WLL): A system that connects subscribers to the public switched telephone network (PSTN) using radio signals as a substitute for the usual copper phone lines for all, or part, of the connection between the telephone subscriber and the switch. This includes cordless access systems, proprietary fixed radio access, and fixed cellular systems. WLL technology is an efficient-as well as cost-effective-way to deploy telephony services to subscribers in remote and regional areas without the expense of burying tons of copper wire. WLL services enable newer telecommunications companies such as Norlink to bypass Telstra's wireline networks to deliver more affordable telephony and data access services.

The Arab World, Culture and Information Technology

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INTRODUCTION

In 801, Harun Rashid offered Charlemagne a water clock, the like of which was inexistent in all of Europe at that time; the King's court thought that a little devil was hidden inside the clock. In the 1930s, King Abdulaziz of Saudi Arabia had to convince his people that the radio was not the making of the devil and that it could in fact be used to broadcast and spread the Quran. In 2003, the Arab region is found to be still lagging in modern technologies adoption (UNDP, 2003). Thus, in a little more than 11 centuries, the Arabs were transformed from leaders to adopters, then to late adopters as far as technologies are concerned.

The Arab world is taken to mean the 22 members of the Arab League, accounting for more than 300 million people with an economy of 700 billion dollars. Although most Arabs practice Islam, they represent less than one third of all Muslims. The Arab world is often thought of as economically prosperous due to its oil resources; yet its total GDP is lower than that of Spain (UNDP, 2003).

Arab countries share language and culture but differ in size, geography, demographics, government type, etc. In terms of spending in and use of IT, statistics portray the Arab world as far from being up-to-date (UNDP, 2003).

This article raises the question of whether existing research models are appropriate to explain this delay. If certain characteristics proper to the Arab culture play an important role in explaining the delay in IT adoption, then we anticipate the answer to be that no existing model is able to adequately study the IT adoption phenomena in the Arab world.

THE ARAB WORLD AND IT

It is a recognized fact that the Arab world lags behind in terms of IT (Aberdeen, 2001; UNDP, 2003). (See Figure 1.) In 2001, Ajeeb reported that the number of Arab Web sites reached 1.24% of the Arab population (Ajeeb, 2001), it predicted that the number of Internet users would equal 5 million by 2001, and reiterated DITnet's

Figure 1. The MENA region is under-performing in terms of IT spending even when compared with other developing regions (Source: Aberdeen, 2001)
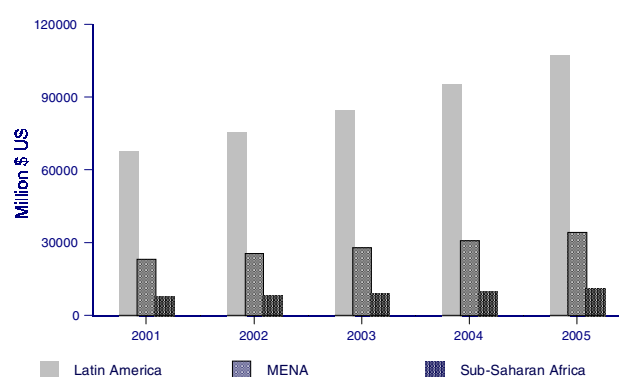
March 2000 prediction that Internet users would number ten to twelve million by the end of 2002. In fact, there were a reported 8.2 million users by the end of 2002.

To date, no Arab country has been able to develop its electronic commerce capabilities to the extent seen in the West.

REASONS FOR THE LAG

The lag can partly be explained by the delay with which technologies have traditionally reached Arab countries[1]. Davison et al. (2000) suggested several other reasons: a perceived incompatibility between local cultures and imported technologies, a preference for autonomy and independence with respect to technology, and a lack of economic resources to acquire technology.

The first two of are plausible as is it often the case that IT stumbling blocks occur not because of technical reasons but rather because of human and social obstructions. The third reason can be excluded for the six Gulf countries which claim per capita revenues of nearly five times the average of the rest of the Arab countries. The rate of adoption of the Internet for these countries is up

to fifteen times that of the rest of the Arab world.

Other factors also explain the low rate of Internet penetration in Arab nations as compared to the rest of the world. In these nations, the rate of penetration is essentially measured based on only one part of society: men.

The Arab Woman

Two thirds of the 65 million illiterate Arabs are women. Women make up only 4% of all Arab Internet users while in Europe women make up 42% on average[2]. The UNDP states that the condition of women is one of the three main factors explaining the current state of economic development in the Arab world.

In that more than 40% of women in Arab countries are denied participation to the technological revolution, Arab nations are failing to integrate a considerable part of their human resources in their future economies.

Information and IT

When Arab countries invest in IT, they do so mainly in hardware. While this may be a characteristic of developing countries, it may also be viewed as Arabs' distrust of anything immaterial. Software on the other hand is associated with innovation, creativity, and the free flow of information and knowledge, qualities that the Arabs have been found lacking (UNDP, 2003). Thus, not only Arabs are increasing their dependence to the West being consumers of hardware, they seem to be passive users of the software and intelligence produced elsewhere.

This issue leads to the tight relationship between information (and not IT, let alone hardware) and democracy and freedom. If Arab countries are truly "information shy" (Henry, 1998), then what information is to be shared and circulated by IT? Therefore, the Arab does not

see what use he could make of IT and would therefore not consider it an instrument of development.

Culture

Culture is "[the] collective programming of the mind that distinguishes the members of one group of people from those of another" (Hofstede, 1991). For Ibn Khaldun, 14th century Arab sociologist, man is son to his habits and his environment, not to his nature and his moods[3].

Hill et al. (1998) claim that the Arab culture is one of the most complex of the world. It is complex for several reasons. Though the majority of Arabs are Muslim, many are Jewish or Christian while others are agnostic and even atheists. Many actions and symbols assume a particular significance. Often in traditional Arab cultures a handshake or the spoken word are seen as more legally binding than a signed contract and the written word has less significance than in other cultures[4].

For Arabs bartering is very different from what the West calls negotiating. The numerous steps involved in bartering hold social meanings, the least of which is to learn about and get more acquainted with the other so as to build trust in terms of the product quality. Selling and buying are social acts not replicated by technology.

In his study of Qatari and Emirati cultures, Solberg (2002) found that "wasta" (social connections and string-pulling) could be used to lower the level of uncertainty during business transactions. Even when more direct means are available, Arabs prefer wasta because of the human contact it offers. Wasta is a way of life that builds upon human interactions, a major part of an Arab's life, which she or he may not be willing to sacrifice to technology.

Figure 2a. While hardware is projected to represent less than 35% of all IT investments in the world…
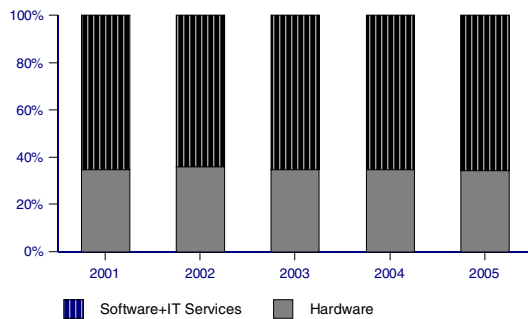
Figure 2b. …it will continue to represent more than 70% of all IT investments in the MENA region (Source: Aberdeen, 2001).
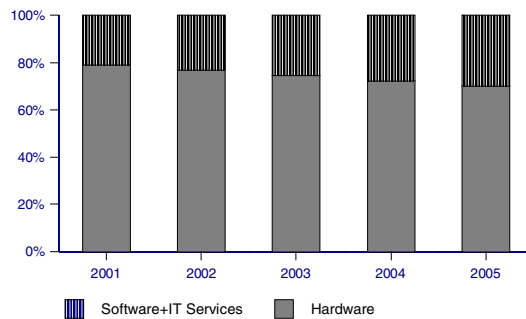
Arabs tend to be more talkative than Westerners; they are fond of sentences with several adjectives, the number of which, combined with the length of sentences and the tone of the voice, make up an integral part of the message. For example, when a guest is offered a cookie, it is customary to not accept too keenly or quickly. It is up to the host to insist (invoking God) to convert the initial refusal into a yes[5]. Arabs rarely say yes or no, rather, they are inclined to answer using less committed terms such as "usually" and "Inshallah". The design of computer interfaces with only the "yes", "no" and "cancel" options is clearly rooted in other cultural norms.

THEORIES AND RESEARCH MODELS

Many research models are available to study IT adoption. Flowers et al. (1975), for example, built upon the framework of Graves (1970) in which people would evolve through levels of "psychological existence" reflecting their personal values and lifestyles, which vary with their cultural programming.

Research using this framework suggests that dominant value systems of Middle-Eastern managers are conformist, sociocentric and existential and their dominant decision-making style is consultative (Amirshahi, 1997).

Another important stream is represented by Hofstede's work (1991) which considers culture a national trait. The results of Hofstede's research is a typology of cultures based on five cultural dimensions: power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation[6].

In research pertaining to IT, some dimensions have been invoked more than others: individualism (Jarvenpaa et al., 1999), power distance (Simon, 2001) and masculinity (Hofstede, 2001b). Findings from Hofstede (2001b) show a relationship between masculinity and fax machines, and femininity and cellular phones. Like authority, a masculine trait, a fax is not interactive; and like exchange and dialogue, which are feminine traits, a cellular phone is interactive.

Certain Arab values could be mapped onto Hofstede's cultural dimensions[7]. What one calls "maslaha el amma" (public interest) happens to mean the exact opposite of individualism. In the Arab culture, public interest could even be extended to the notion of Umma (nation). Family commitments and responsibility towards authority figures and political leaders are often held as priorities over other matters. Arabs from the Gulf swear allegiance to the family, clan, tribe, religion, and nation[8] (Abbas, 1987). Usunier (1993) suggests that Arab cultures tend to resemble cultures that are focused on the present and for whom the future (destiny) is inevitably predestined

(Mektoub) by God (Inshallah: God willing). For Patai (1973), fatalism is a predominant trait of the Arab culture. If past-oriented cultures are more passive than future-oriented cultures, the Arabs should have an attitude that can be summarized as "if it is written then it will happen" henceforth they will not feel the urge to go toward the technology and will expect it to come to them[9].

LIMITATIONS OF EXISTING MODELS

The Absence of Arab Dimensions

If in Hofstede's model, the first four dimensions are applicable to other cultures, it would be useful to more closely study Arab values in order to include them in existing models.

Cultures are likely to diverge rather than come together as we would assume on the basis of globalization and the democratization of media. Hofstede (2001b) has shown that cultures are diverging rather than converging. More specifically, current world events do not lend support to the hypothesis that Arab and Western cultures are closing in.

Current research models would therefore benefit from including Arab dimensions; otherwise they would risk being applicable only to those cultures for which they were developed or for the Arab culture to continue being perceived through the lens of another culture. This could be done following the example of the Far East cultures. These cultures were really only taken into account into Hofstede's model with the addition of the fifth dimension, Confucian dynamism, thereafter called long-term orientation. It was added in order to complete Hofstede's model since it was the dimension that distinguished western and far-eastern cultures.

The Implicit Cultural Homogeneity

Differences exist among Arab countries (Solberg, 2002), and even between different regions of a same country. This is even more noticeable as the borders between Arab countries were often drawn arbitrarily during colonization.

Fundamental cultural differences exist between Sunnis and Shiites, among them masculinity (Noland, 2003). Sunnis are considered more "triumphant" (sic.) while Shiites focus more on suffering. The two strains of Islam could therefore be considered at the extremes of the masculinity dimension although scores for this dimension place the Arab world at the midpoint of the scale. However, even Sunnis bear certain feminine traits such as seeking good relationships with leaders

and cooperating with colleagues in order to foster equally good relationships with them (Weir, 2001).

Differences can also be found between the cultures of the Gulf and other nations of the Arab world. The discovery of oil in the 1930s resulted in an odd mix of traditional and tribal cultures with modern cultures. This mix did not manifest itself in North Africa resulting in the Arab world composed of countries generally having either people or oil[10]. Furthermore, North African countries have not always had Arab identity. Unlike the Gulf countries, they became Arabs at the same time as Muslims.

The Cultural Barrier

Arabs, Arab culture, and Arab religion have always been a black box for the Westerner. For instance, some westerners have a near-Manichean tendency to dichotomize (Good vs. Evil, Them vs. Us, etc.) and are fond of clash-of-civilizations theories (see Huntington, 1996). El-Solh and Mabro (1994, p. 14) show how the application of over-simplistic dichotomies to the study of gender relations in the Middle East have left out much of the flexibility women might have in actual terms. The simple idea that the sexes have a complementary role in Arab society has often been misunderstood in Western studies as a binary opposition with a tacit hierarchy.

Furthermore, if by fatalism it is understood that humans have no say in their destiny, then the concept of time orientation of Patai (1973) originates from a fundamentally inaccurate understanding of a large part of the Arab world. Islam is founded on the promise of salvation (Jenna) or the threat of damnation (Jehenna). Debates on the "kadha and kadar"[11] (destiny and predestination) continue to fuel the controversy that divides theologians on the issue. Suffice it to mention that Arab societies do not necessarily neatly fit within cultures anchored in either the past or the present.

CONCLUSION

Significant contradictions may exist between how Arabs perceive themselves and how they are perceived by others. For example, Hill et al. (1998) argue that the adoption of technologies is rarely in quest of imitating the West. But Ibn Khaldun maintains that imitation is characteristic of Arabs. Abbas and Al-Shakti, (1985) even suggested that Arab executives are the product of cultural values that tend to produce more followers than leaders**.** Yet, imitation is sometimes suspicious in the Muslim's eye as some believe that imitation of the non-Muslims is "haram" (sinful) While it is also believed that imitating non-Muslims is permissible, the average Arab

Muslim sometimes wonders when imitation stops being haram and starts being hallal (allowed)[12]. How to reconcile these points of view?

Two theories seem promising in that they may complement the research models we reviewed here. Social Identity Theory recognizes that cultural layers exist that describe different levels of programming (social, national, regional, religious, contextual, organizational, etc.).

Abdul-Gader and Kozar (1995) borrowed the construct of technological alienation from psychosociology to explain certain purchase and use decisions of IT. They showed that alienated individuals resist any kind of technology adoption. More generally, Value-Expectancy Theory (Feather, 1995) promises to enrich the debate on IT adoption by Arabs since it addresses the issue of the value attributed to things by individuals and their expectations, founded or not, such as their resistance to the possible danger of technological and cultural dependence. This is all the more valid that Arabs view IT as a technology, not as a medium of knowledge and of accessing knowledge, something they need direly as evidenced by the conclusions of the UNDP (2003).

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KEY TERMS

Arab World: The Arab world is taken to include all 22 countries members of the Arab League.

Culture: According to hofstede (1991), it is "[the] collective programming of the mind that distinguishes the members of one group of people from those of another". For the 14th century arab scholar, ibn khaldun, man is son to his habits and his environment, not to his nature and his moods. In all the literature about culture, there is a common understanding that culture is an abstraction from concrete behaviour but is not behaviour itself. Hofstede's typology includes five cultural dimensions:

- **Individualism:** as opposed to collectivism, describes the degree to which a culture relies on and has allegiance to the self or the group.

- **Power Distance:** reflects the degree to which a culture believes how institutional and organizational power should be distributed.
- **Masculinity:** indicates the degree to which a culture values such behaviours as assertiveness, achievement, acquisition of wealth, social supports and the quality of life.
- **Uncertainty Avoidance:** refers to the extent to which a culture feels threatened by ambiguous, uncertain situations and tries to avoid them.
- **Long-Term Orientation:** reflects the degree to which a culture is oriented toward the search for virtuous behaviour rather than being oriented towards the search for truth.

Information Technology: Hardware, software, network and services related to the use and operation of equipment with the aim of processing and communication of analogue and digital data, information, and knowledge. These include computers and computer applications such as the Internet, Intranets, Extranets, Electronic Data Interchange, electronic commerce, mobile and fixed lines, etc.

ENDNOTES

[1] Most technological innovations are adopted by the Arabs with some delay. For example, if the printing press was invented around 1450, the first Arab book to have been printed was the Quran, in 1537 in Venice. Arabic character-based printing reached the Arabs only in 1728 under the reign of Ahmed III (1703-1730) when the Arabs were occupied by the Ottoman Empire. Bukhara (today's Uzbekistan) delayed the introduction of printing until 1917 (See Khalid, 1994). It is as though in the Muslim world, the advent of printing broke the ulama's long-established control of knowledge. Similarly to the Bible and the printing press, no longer could knowledge be obtained through someone "more knowledgeable". It could be read and understood - or misunderstood—in libraries, schools, and even homes. Later, while e-mail was invented in 1971, the first Arabic Web-based mail solution was released in December 1998 (see http://web1.maktoob.com/maktoob/press1998/press1998-1.html). See more on Kaitlin Duck Sherwood's site, http://www.webfoot.com/advice/WrittenArabic.html.

[2] Nielsen//NetRatings (May 2003), www.journaldunet.com/cc/01_internautes/inter_profil_eu.shtml, accessed August 31, 2003.

[3] Ibn Khaldun, The Muqaddimah, An Introduction to History, Translated from French by F. Rosenthal, Princeton, 1958; 1967.

[4] For Muslim Arabs, this may be explained historically and religiously by the fact that when the Divine message was delivered, the Angel Gabriel dictated the Quranic verses to the Prophet Muhammad. In all pre-modern times, documents were not copied; they were memorized, where there was no other way to preserve them.

[5] In his book, "The Saddam Years" (Fayard, 2003), Saman Abdul Majid, personal interpreter to the deposed dictator, explains how, in 1993, President Clinton sent a secret agent to Iraq to suggest that a new leaf be turned over and that discussions be resumed. Saddam did not immediately answer, an act that Clinton took as a refusal. That file was then closed. In fact, Saddam was expecting a more solid and thought-out proposition to be put forward, and was surprised that Clinton did not come through with one. This mis-communication between two men of very different cultures has had the now all-too known consequences.

[6] It is assumed that most readers are familiar with Hofstede's work. Due to space limitations, details of his work will not be elaborated here. For more information, the reader is referred to Hofstede (2001b).

[7] Also of interest is the GLOBE (Global Leader and Organizational Behavior Effectiveness) project which seeks to determine the relationship between leadership and societal culture (House et al., 2002). GLOBE uses nine dimensions, six of which are the same as Hofstede's: uncertainty avoidance, power distance, institutional collectivism, in-group collectivism, gender egalitarianism, assertiveness, future orientation, performance orientation, and humane orientation. Using these dimensions, Gupta et al. (2002) identified 10 "cultural clusters": Asia, Anglo, Arab, Germanic Europe, Latin Europe, Eastern Europe, Confucian Asia, Latin America, Sub-Sahara Africa and Nordic Europe. Unfortunately, often in GLOBE papers, the Arab cluster is composed of very few countries (see Abdalla and Al-Homoud, 2001). Other countries, such as Turkey, have disconcertingly been found in such "Arab clusters" (see Kabasakal & Bodur, 2002) ignoring the fact that Turkey is not a member of the Arab League and

[8] overlooking its claim to European Union membership.

[8] Perhaps even in this order, especially if one takes into account the famous proverb in which an Arab states: "Me, against my brother; my brother and I against our cousin; my brother, my cousin and I against all others." Was it not written of Ishmael (and by extension of all Arab children) in the Bible that "And he will be a wild man; his hand will be against every man, and every man's hand against him; and he shall dwell in the presence of all his brethren" (Genesis 16:12). This, however, does not seem to hold any longer given the events that took place between Iraq and Kuwait in 1990-1991 as well as since then.

[9] Judging by the lack of cultural sensitivity of today's' graphical user interfaces and icons, that technology is all but coming to the Arab culture.

[10] The only exception being Iraq.

[11] This highly philosophical issue revolves around the overly simplified question that if God had already decided on much of what we humans will do on Earth even before we were created, what is the Last Judgment about?

[12] One has to remember that the digging of the trenches around Madina in the battle of Al-Ahzab, which was led by the prophet Mohamed (Peace Be Upon Him) and his companions as a defense system, and the application of Omar Ibn Al-Khattab, the second khalif after the prophet, of the filing system in the Islamic State, for organizing taxes on cultivated land and payroll of the soldiers are examples of imitation as they were borrowed from Non-Muslim Persians (see more on this subject on www.islam1.org/khutub/Imitation_of_None-Muslims.htm, accessed April 13, 2004).

Assessing Universal Access to ICT in Ghana

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INTRODUCTION

Information and Communication Technologies (ICT)[1] have become part of the key factors driving social and economic advancement. They have not only altered the way people live, work, communicate and entertain themselves but also created a new infrastructure for business, scientific advancement and social interaction.

Given the importance of ICT, many countries (developed and developing) have evolved policies that would enable every citizen to participate in the digital revolution. However, access to the ICT is concentrated in few regions, countries and population groups. The result is that there is a deepening gap between the developed and developing countries in the availability and accessibility to ICT services. This is referred to as the digital divide. The digital divide is following and supplementing the prevailing income and economic divides existing between developed and developing countries (Navas-Sabater, Dymond & Juntunen, 2002).

According to Navas-Sabater, Dymond and Juntunen (2002), there are two aspects of the digital divide—poverty and isolation. They defined the two aspects, as disparity between the rich and the poor on one hand, and disparities between urban and rural areas on the other. They argue that although both components are important, isolation poses a greater challenge to the utilisation of the service. Therefore, addressing the internal disparities becomes central to universal access discussions.

The policy objective of developed countries is to ensure equal access to ICT services by all the populace—universal service. The concept of universal service is based on the need for uniform geographical coverage of the service, quality, price, and the service offered on a non-discriminatory basis so that the expected benefits of ICTs would be available to the whole population (Tarjanne, 2000). The concept of universal service has increasingly been narrowed down to the connection of households to the public-switched telephone network. Here, the objective is to achieve a minimum level of ICT services that must be available to all users regardless of where they are living and at a price which should be affordable to all (Wellenius, 2000).

Developing countries on their part have adopted a policy that emphasises community's access to ICT services—universal access. Efforts to promote universal access to ICT in Africa have been on the agenda of meetings of high-level policymakers since the early 1990s (Etta & Parvyn-Wamahiu, 2003). As a result different criteria such as distance, population size, time, etc., have been used by these countries to define what they mean by universal access. For example, in Ghana, the criterion is a telephone in every locality of 500 people, whilst in Burkina Faso it is a telephone within every 20 km (ITU, 1998).

The objective of this paper is to assess the deployment of ICT to achieve universal access in Ghana. Given the broad definition of ICT, the assessment will cover telecommunication (specifically telephone), the Internet, computer hardware and broadcasting (radio and television). Until 2003, achievement of universal access in Ghana was more related to increased penetration of telephones—fixed line and mobile, therefore, prominence is given to the deployment of telephones.

UNIVERSAL ACCESS POLICIES IN GHANA

For a long time, Ghana had no definite policy on universal access to ICT services. However, references can be made to programmes that gave some indications of government's intentions. The first of such programmes was the Accelerated Development Plan (1994 – 2000) for the telecom sector. The general objective of the Accelerated Development Plan (ADP) was to revamp the telecom sector through the participation of the private sector to meet the increasing social and economic needs of Ghanaians. This was to enable Ghana to be integrated into the global economy as well as achieving the broad national objective of becoming the "gateway" to West Africa (Atubra & Frempong, 1999).

The government under the ADP adopted the use of pay phones as a way of achieving universal access. The target was to provide every rural community of 500 people with one pay phone. The ADP also had the objective of

raising the national teledensity to a level between 1.5 and 2.5 by the year 2000.

The second evidence of government's policy on universal access can be found in the National Communications Regulations of 2003 (Legislative Instrument). Section 2 of the Legislative Instrument emphasised that the services of communication operators should reach the entire geographical areas specified in their licenses, which include rural, remote parts and sparsely populated areas. Therefore, in the issuance of licenses, the National Communications Authority (NCA) had an intrinsic objective of ensuring universal access to ICT services.

The first succinct ICT policy for Ghana was launched in the latter part of 2003. For universal access, the general objective was to promote equal and universal access to ICT services and resources to all communities. The universal access objective is to be achieved through:

- Implementation of community-based national ICT programmes and initiatives including telemedicine, multi-purpose community telecentres, tele-education and schoolnet initiatives.
- Community–based village information and communications infrastructure initiatives.
- Special ICT initiatives targeted at the disadvantaged communities and sections of the Ghanaian society, including the underserved communities and the physically and mentally challenged (Ghana Government, 2003)[2].

ICT INFRASTRUCTURE

In the early part of the 1990s, Ghana liberalised both telecom services and the airwaves. This liberalisation policy had had profound impact on the development of ICT infrastructure[3] in the country. In this section, we provide an overview of the deployment of ICT infrastructure in the country. The overview shall include telecommunication, the Internet, radio and television.

TELECOMMUNICATION SERVICES

Fixed Line Telephones

There has been considerable improvement in the penetration of fixed-line telephones in the country. In 1990, there were a little over 44,000 telephone lines in the country and this increased to 288,500 in 2003.

Ghana has three companies providing fixed line telephone services—Ghana Telecom (GT), Westel and Capital Telecom. In 2003, there were 291,978 telephones in the

country of which the incumbent GT had about 98.8% share. The teledensity of the country was 1.42.

Work by Frempong (2004) revealed that the Greater Accra Region, which hosts the national capital has about 67% of the telephone lines in the country. In this sense, availability of the service in the other regions was limited and therefore, has negative implications for achieving universal access to the service (see Figure 1).

The concentration of telephone lines in the Greater Accra does not necessarily mean that there is increased access by residential users. Most of the service is subscribed to by government departments and agencies, and corporate organisations operating in the Accra-Tema Metropolitan Assemblies.

Pay Phones

There has been a considerable improvement in the deployment of the service in the country. There were only 25 pay phones in the country in 1993, but as at 2003, the

Table 1. Basic telecommunications data (ITU [2003] Telecom Inidcators and Ghana Telecom [2004])

Indicators	Number
Fixed-Line Telephone Networks	3
Fixed Telephone lines	291,978
Teledensity (Fixed telephone lines)	1.42
Waiting list for Fixed Telephones	183,755
Pay phones	6,921
Pay phones (per 1000 inhabitants)	0.33
Ratio of Pay phones to Fixed Telephone Lines	1:43
Cellular Mobile Telephone Networks	4
Mobile subscribers	775,000
Mobile subscribers per 100 inhabitants.	3.8
Ratio of Fixed Telephone subscribers to Mobile subscriber	1:2.7
Total No. of Tel. Subscribes (main line + mobile)	1,066,978

Figure 1. Regional distribution of Ghana Telecom fixed line telephones
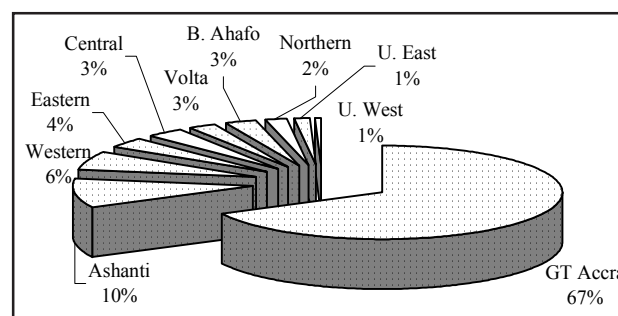
number had risen to 6,921. The penetration of pay phones per 1,000 people in 2003 was 0.33, while the ratio of pay phones to private main telephones was 1:42. But the penetration level is less than a pay phone for a community of 500 and in this sense the goal set by government with respect to the development in rural areas was not achieved.

Communication Centres

Another source of telephone service is through what is locally called Communication Centres. Communication Centres in Ghana are basically private commercial ventures which re-sell telephone services from a few number of lines obtained largely from Ghana Telecom. They do not include Internet cafés. However, some of the operators have arrangements with some of the Internet Service Providers (ISPs), notably Africa Online to provide points where people can send and receive e-mails**.** At these Centres, people make and receive calls and this provides an important access to telephone service for the rural population.

In general, there has been appreciable improvement in the access to telephone service including pay phones after the liberalisation of the sector in 1996. This is contrasted with the situation in some African countries where mobile telephone deployment has negatively affected fixed line telephone.[4]

Mobile Telephones

Mobile telephony was introduced into the country in 1992 by Millicom SA. Presently, there are four mobile telephone companies—Millicom Ghana Limited, Kasapa Telecom, Scancom Ghana Limited and One Touch (a subsidiary of GT)—making Ghana one of the most liberalised mobile telephone markets in Africa as the African average is two mobile operators. The total mobile telephone (i.e., cellular) subscription in 2003 was 775,000 with mobile teledensity of 3.8. The deployment of mobile telephones outpaced the fixed-line telephones in 2002. The ratio of fixed line to cellular mobile telephone was 1:2.7.

Mobile telephony in Ghana started early within the African context. However, subsequent development was not as fast as in many other countries. For example, countries like Senegal, Cote d'Ivoire, Cameroon, Kenya, Tanzania and Uganda have outperformed Ghana (Frempong and Henten, 2004). In 2001, mobile penetration in Ghana was 0.64, while that of Uganda, which introduced the service six years later, was 1.16. Absence of rigorous competition among the operators, especially between 1993-2000 largely contributed to the poor performance of the sector.[5] Problems of interconnection has also negatively affected the operations of the mobile telephone companies.

INTERNET

Internet penetration in Ghana is very low compared to some African countries, especially the Republic of South Africa and the Maghreb region. In 2003, South Africa had more than 3.1 million Internet users, Egypt had 1.9 million users, while that of Ghana was 170,000 (ITU, 2003). Most users in Ghana have access through shared Internet connections—offices, cyber cafes, friends and to a less extent homes (Ahiabenu II, 2003). The country had 313 Internet hosts in 2003 and users per 10,000 inhabitants were 78.4 (see Table 2) which were below the African average of 123.21.

The Internet cafes are the most important sources of Internet access. In early 2003, there were over 750 Internet cafes in Ghana mostly using dial-ups. About 90% of these cafes are located in Accra, with the rest in the other cities such as Kumasi and Takoradi (Ahiabenu II. 2003).

BROADCASTING

Television

As of September 2003, the NCA had licensed 21 companies to broadcast and/or re-broadcast foreign TV signals in the country. Out of this number, only 10 are operational. Four companies were to provide free on air services of which three were to cover the whole country.

Table 2. Other ICT indicators (ITU, Information Technology Data [2003)]and NCA, 2003 Please note: not all service providers have commenced business)

CATEGORY	No.
Paging Service Providers	10
Internet Service Providers	112
VSAT Data Operators	96
Public/Corporate Data Operators	57
FM Stations	127
TV Stations	21
TV Sets	1.1 million
Total of Personal Computers	82,000
Personal Computers (per 100 persons)	0.38
Radio per 1000 persons (in 2000)	710
TV per 1000 persons (in 2000)	118
Internet Host	313
Internet users	170,000
Internet users per 10,000 inhabitants	78.43

However, it is only Ghana Broadcasting Corporation which has nation-wide coverage. The rest provide the service on a "pay as you view" basis largely in Accra-Tema, Kumasi and Takoradi—the major cities in the country.

In 2000, the penetration rate of television sets was 118 per 1,000 persons. In absolute figures, there were about 1.1 million TV sets in the country. However, the number might have improved considerably due to the influx of used TV sets into the country largely from Europe.

Radio

The National Communications Authority in September 2003 had allocated frequencies to 127 companies to operate FM radio stations in the country. However, not all of these companies had utilised their licenses. But a greater number (about 62%) of the companies had commenced business (Braimah and Frempong, 2003). From Figure 1, FM radio stations are available in all the 10 regions of the country. However, the majority (69%) of the stations are located in four regions - namely Greater Accra, Ashanti, Western and Brong Ahafo. The rural-based regions, especially the three in the northern part of the country had less FM stations. Therefore, access to radio services is more pronounced in the urbanised regions of the country.

From Table 2, though the number of TV and radio sets is not significantly high, the communal way of life, especially in the rural areas, increase the accessibility to the two services. People in such areas can watch TV and listen to radio programmes from the homes of friends and relations, and in this case, provide accessibility to the service.

REGIONAL DISTRIBUTION OF ICT COMPANIES IN GHANA

From the survey conducted as part of the Scan-ICT study[6] in 2002, close to 45% of the ICT companies surveyed were in the Greater Accra region (mostly in Accra, the national capital). Ashanti Region, (mostly in Kumasi, the second largest city in Ghana) had 31% and 10% in the Central Region (see Table 3). Predominantly rural-based regions were not attractive to the ICT companies, due to the smallness of the market in those regions. In this case the vast majority of the people are denied access to the services those companies provide.

The ICT companies surveyed were business houses involved in the sale of ICT equipment, peripherals and services that conform to the International Standard Classification (ISIC) Rev. 3 and Rev. 3.1 of 2002. They include wholesale and retail of electronic and telecom equipment,

Figure 2. Regional distribution of FM stations as of September 2003
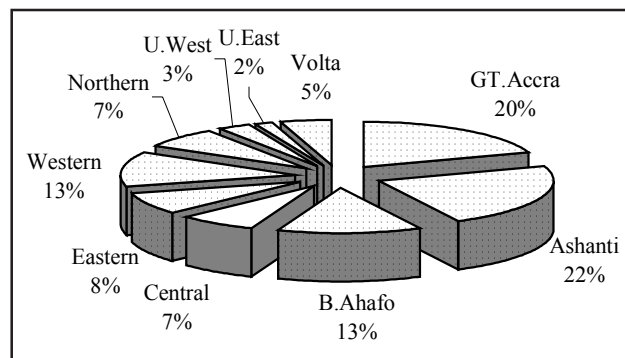
computers, peripherals, software, television and radio receivers. Others were involved in ancillary activities such as training, repair, installation of ICT related equipment and peripherals, and wiring of customers' premises.

These companies are important to the achievement of universal access as they enable people to acquire ancillary services, ICT equipment and peripherals, and invariably help increase access to ICT services. Profit being the ulterior motive of every business, these companies concentrate in areas where there are markets for their products and services. Invariably, their concentration in a particular locality (in this case Accra and Kumasi) will help increase the access to ICT services.

To conclude, there has been considerable improvement in ICT infrastructure in the country. The liberalisation of the telecom and the airwaves provided a springboard for the introduction of many ICT services in the country. However, the objective of achieving universal access is still a mirage. Deployment of ICT infrastructure is skewed to the urban areas. In that case, the majority of the populace who reside in the rural areas have limited access.

Table 3. Regional distributions of ICT companies (INIIT, The Ghana Scan-ICT Study, 2002)

Region	Percentage
Gt. Accra Region	45
Ashanti Region	31
Central Region	10
Western Region	4
Eastern Region	3
Brong Ahafo	2
Volta Region	2
Upper West Region	1
Upper East Region	1
Northern Region	1

CHALLENGES TO ATTAINING UNIVERSAL ACCESS

The discussion has revealed that in spite of the significant improvements in the deployment of fixed line and cellular mobile telephones, universal access is still far from realisation. A number of factors have constrained the attainment of universal access in the country. In this section, we shall look at some of these constraints.

Interconnection

One of the major problems that has mitigated against the achievement of universal access is interconnection between telecom operators. Telephone is the foundation for many of the ICT services. The interdependent nature of the telecom networks make it necessary for all operators to interconnect to provide a seamless network to enable users from different networks to communicate (Melody, 2001). The reform and the subsequent introduction of competition in telecom services have made interconnection a prominent feature of the telecom market.

Interconnection difficulties have adversely affected the deployment of telecom services and also constricted access to the service. Restrictive interconnection agreements had affected the performance of the other operators. For example, interconnection controversies between Westel and GT delayed the former in launching its services in 1998. Problems of obtaining more E1s[7] from GT had also constrained the ability of the mobile telephone operators to expand their services as quickly and widely as possible.

The problem of interconnection had also negatively affected the flow of foreign investments into the sector to help in the expansion of the network to improve the accessibility. For example, Westel attributed its inability to attract more investment to expand its service to the initial interconnection problems it encountered with GT. According to Westel, the problem sent a wrong signal to prospective investors and they became apprehensive about investing in the country.

Affordability

Access to the service is not only the physical availability but also the issue of affordability. Affordability depends on the financial strength of customers to pay for the service. In Ghana, accessibility and affordability are critical problems confronting the achievement of universal access.

The increase in the interconnection charge between cellular mobile and fixed line networks from US$0.06 to US$0.2 per minute in October of 2003 had serious financial implication on accessibility to telephone service, especially for rural dwellers. The increase in the interconnection call rate meant that callers to the cellular mobile network from fixed-line telephones had to pay more for the service. For example, previously callers to cellular mobile networks from fixed-line networks paid US$0.1 per minute, however with the new tariffs, they pay US$0.3 per minute at the communication centres.

The communication centre and Internet café concept provides a better way of ensuring universal access to ICT services in the country. At these cafes and centres, users can make and receive calls, send and receive faxes, check e-mails and browse the Internet for a fee. Presently, the average cost of browsing the Internet for one hour is US$0.65. This is increasing accessibility to the service, especially for the young people in the urban areas.

One of the problems affecting Internet penetration is limited access to telephone service and high connection charges. Access to Internet service is mainly through the dial-up system. Therefore one pays the normal telephone charge of US$0.02 per minute for a dial-up access, in addition to the monthly subscription. The Network Computer System in 2003, charged a one-time connection fee of US$50.00 and a monthly subscription of US$35.00 for unlimited Internet service. The charges are considerably high for many potential private subscribers.

Low E-Literacy Level

The idea of e-literacy is based on the premise that people have the skills, awareness and understanding to participate in the e-services such as e-governance and e-mail service. People should be e-literate (individual e-readiness) to make use of these opportunities given by ICT technologies. The ability to become e-literate is strongly linked to being literate (ability to read and write) as ICT services are knowledge-intensive.

However, the low level of literacy in the country is a handicap to many people becoming e-literate to utilise these services. The estimated illiteracy level in Ghana is about 38.1% (Ghana Statistical Service, 2000) and in this case, a sizeable number of Ghanaians cannot use these knowledge-intensive services even if they are available in their communities.

CONCLUSION

It can be concluded that generally there has been improvement in the deployment of ICT infrastructure in the country since the liberalisation of telecom and the airwaves. However, the achievement of universal access is still far away from reality because much of the improve-

ments in the ICT infrastructures are concentrated in the urban areas. The accessibility to telephone service (presently fixed line) is the first step towards the participation in the digital revolution but the teledensity is greatly skewed towards Accra, the national capital.

It is argued that the use of pay phones as a strategy to achieve universal access has limitations. Pay phones can only support voice communication and if universal access is extended to cover data transfer then pay phones will not be suitable. Therefore, there is the need to adopt a system that can support access to broad range of ICT services.

In terms of the electronic media, its uniqueness presents a better accessibility than telephones. One can easily receive the signal of radio and TV broadcast if one lives within the coverage area. The limiting factors, especially access to TV, are the initial cost of the set and availability of electricity. Notwithstanding, the communal way of life of most Ghanaians, especially those in the rural areas will enable many rural people without TV and radio sets to benefit from others.

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KEY TERMS

Communications Centres: Commercial ventures which are reselling telephone services from a few number of telephone lines.

Digital Divide: The disparity in access to ICT services between people of different countries and those of the same country.

E1s: The links used for the physical interconnection between different networks.

ICT Infrastructure: The deployment of telecom (both fixed and mobile), TVs, radio, computers and Internet connections to enable the populace access ICT services.

Internet Cafes: Business units that resell Internet access to people.

Internet Service Providers: Companies that provide Internet access to individuals, groups or corporate organisations through normal telephones, satellites or fibre optics.

Universal Access: Communal access to telephone and other ICT services usually measured by indicators such as distance, population and time.

Universal Service: Widespread access to telephone and other ICT services normally related to household access.

ENDNOTES

[1]   For the purpose of this study Information and Communication Technology (ICT) includes the production and utilisation of hardware, software and services for the processing, communication and maintenance of information.

[2]   Programmes for the implementation of these universal access strategies and programmes are yet to be drawn as the national ICT policy was launched in the latter part of 2003.

[3]   ICT infrastructure as used here refers to the deployment of telecom (both fixed and mobile), TVs, radio, computers and Internet connections to enable the populace to access ICT services.

[4]   This was the general observation of the papers presented by the members of Research ICT Africa network meeting held in Cairo on 2nd May, 2004 as part of the Expert Forum on Telecom Regulation organised by World Dialogue on Regulation.

[5]   The launch of One Touch mobile service by the incumbent in October 2000, brought some dynamism into the market.

[6]   The SCAN-ICT project—an initiative of the International Development Research Centre (IDRC) and the Economic Commission for Africa (ECA) is designed to: build support for the phased development of a comprehensive African capability to collect and manage information on key ICT-related indicators to support the growing investment in ICTs as well as the transition of Africa to an information society.

[7]   The E1s are links used for physical interconnection between different networks.

Assessment of E–Government Projects

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INTRODUCTION

This article considers the issues relevant to assessing the success or failure of large-scale e-government projects in India. Prior research has highlighted a number of possible reasons why e-government systems in Less Developed Countries (LDCs) fail, underscoring, principally, the issue of the design-reality gap or design-actuality gap. We find that this analysis, though useful, is inadequate to capture the immense complexity of e-government systems design and implementation. This article proposes and elaborates on three issues that must be examined in the context of any e-government system in an LDC to assess its success or failure, in addition to other analyses. These issues are: demand- and supply-side stakeholder analysis, second order effects, and analysis of incentives for governance efficiency. We use the Bhoomi e-government system implemented in the state of Karnataka, India, as an exemplary system to elaborate on these issues and also to discuss concrete the theoretical aspects.

The article begins with a background of the literature on assessment of e-government systems and considers the issues of analysis, design and implementation of such systems. It then follows this review with a brief overview and history of the Bhoomi land records system. This is followed by a discussion of the issues of stakeholders, second order effects and incentives.

BACKGROUND: MEASURING E-GOVERNMENT SUCCESS

E-government systems that are designed for services that a population may use are typically hard to classify as successes or failures as the period of evaluation is a crucial factor in the assessment (Heeks, 2002b). Such systems may enjoy early success followed by declines in usage and then another upsurge, etc., where, if the metric of success is the number of people who "adopt" the service, the time at which the measurement is made may decide the evaluative result. These systems may be categorized as successes, partial failures or total failures, thus including in a continuum the measure of success. Heeks develops a theory of a "design-actuality

gap" between the current system and the vision of the future system that the builders have constructed based on the people, processes, structures and technology that are required. In another paper Heeks (2002a), identifies seven dimensions that help to map the difference between "where we are now" and "where we want to be." These dimensions, such as information, technology, processes, etc., help to find a gap (or lack thereof) in the achievements of the e-government system in relation to its design and implementation objectives.

Other research has highlighted factors that impact the success of e-government systems. Buckley (2003) showed that quality of public services through e-government offerings is predicated on the service meeting the criteria of having homogenous consumer groups, definable tasks and measurable outcomes. Burn and Robins (2003) found that a process change model proposed in the literature (Guha et al., 1997) was adequate for analyzing an e-government implementation. Hazlett and Hill (2003) found that delivering high service quality through e-government implementations is fraught with complexities, the most important of which is the dilemma of both reducing costs and improving quality. They argue that e-government implementations were motivated by "idolatrous" leanings toward technology rather than rational comprehension of the complexities involved. Devadoss and others (2002) used a structuration model, which examines the symbols of signification, domination and legitimation of the system within the social context, to analyze e-government projects. They identified tele-cooperation in the initial stages of the project to be important for the project's success, where tele-cooperation entails a holistic view of the project by all the participant agencies and actors. Layne and Lee (2001) developed a four-stage growth model based on the complexity and integration requirements of e-government projects to enable designers to "think about" the implementation process. Warkentin and others (2002) highlighted trust as the most important factor affecting e-government adoption and proposed a multi-pronged approach to build citizen trust.

The above literature review is a sample of papers that have appeared in the area of e-government project assessment. There are a plethora of methods, frameworks and models by which e-government implementation processes and outcomes may be measured and assessed,

and each is linked to a particular culture or economy. In the section below the Bhoomi e-government system is discussed, and the following discussion highlights some of the issues that arise in the context of Bhoomi that are not addressed by the models covered in the review.

THE BHOOMI SYSTEM

The Bhoomi e-government project of Karnataka is fast gaining recognition as one of the best-implemented projects in India. As of this writing, the Bhoomi model of digitizing land records and implementing a system of easy access to records, for verification and changes, is being adopted by the Government of India to replicate on a nationwide basis. This follows a felt need by the government to improve services for the bulk of India's over 1 billion population that is engaged in agriculture. The Bhoomi project is designed for the computerization of land records and all operations that surround it, such as, obtaining a copy of a land record, correction of errors on a land record, the mutation of land records, etc. The process was initiated in 1991 with financial support initially from the Government of India. To date about 20 million land records have been digitized covering the land holdings of some 6.7 million farmers in the state. Bhoomi kiosks are now located in all 177 taluks (a division of a district) of the state's 27 districts.

Bhoomi is one of numerous e-government projects undertaken by state governments in India over the last decade to introduce transparency and efficiency in government functioning. Such ventures are designed to enhance convenience in dealing with the government through easier, faster and smoother alternatives available to citizens. Bhoomi is considered to be a successful e-government project in India. Some of the stated reasons for this are: (1) Bhoomi has the most comprehensive backbone application of all the projects (a database of land records and associated cropping details), (2) Bhoomi is a self-sustaining project, (3) Bhoomi's success has gained international recognition and it was awarded a Silver Medal in the CAPAM (Commonwealth Association for Public Administration and Management) International Innovations award in the year 2002. (The CAPAM association covers over 80 countries.)

Bhoomi computerizes records of Rights, Tenancy and Cultivation (RTC), a document that establishes ownership, records succession of ownership, and crop details. In addition, farmers use RTC documents while seeking loans, getting scholarships for children, bail applications and crop insurance applications.

The manual system that Bhoomi replaced required the farmer to find the village accountant (VA), set up an appointment, make the request, pay the requisite fees and bribes, and then wait several days (sometimes weeks) to obtain the document. In the Bhoomi system, the farmer approaches the Taluk kiosk for the RTC and makes a request by providing necessary information to the kiosk operator. Once a request is received, the relevant record is retrieved from the system. The main difference to the farmer is the speed at which his record can be retrieved, verified and printed (15 minutes on average) on Bhoomi as opposed to the manual method. For the VA, the difference is also in the speed of access, but a greater difference is the loss of control over the process and the data. Independent sources who have verified Bhoomi's usage through direct evaluation reported that farmers found the system to be easy to use and access, had fewer errors in their certificates and saved time in getting their records. Users also saved money in lost wages and bribes (Lobo & Balakrishnan, 2002).

COMPLEXITIES IN THE BHOOMI PROJECT

Bhoomi's design started in 1991 and the system became fully operational by 2001. It was hailed as a success by the media and observers, however, Bhoomi's eventual success is not without contradictions and compromises built into the governance mechanisms. Some issues that arise are:

- The digitized land records are maintained in each district and any farmer can access his or her information for a nominal fee. This introduces transparency in the information related to land records. However, it has also enabled the records to enter the public domain. There is no restriction on who can have access to the land information. This is a breach of privacy and could lead to misuse.
- The time required to obtain a copy of an RTC is much lower with the new system. However, farmers now have to travel a longer distance, to the taluk headquarters, and the average for the return trip takes about a day. The costs include the cost of travel, incidental expenses, and, in some cases, a loss of wages.
- Bhoomi is a silo application. It was funded, staffed and promoted by the Revenue Department of Karnataka, and other departments did not participate in its design nor do they use the data available in the system.
- The Bhoomi project did not include the digitisation of maps of the farming lands and the management of these maps remains a manual process. Also, the

updating process for the maps is back-logged by a few years. This is a serious impediment to the widespread adoption of Bhoomi as an over-arching land governance system for Karnataka.

Who are the Stakeholders?

Systems that are designed to deliver e-governance applications are typically initiated, supported, funded, championed and heralded or criticised by various stakeholder groups. E-government projects in the various states in India have had a variety of supporters (and detractors) throughout their life cycle. The stakeholder groups will vary depending on the political processes and structures in place at the site of the project. Citizens are typically not involved in the initiation of most government projects. However feedback obtained from them, as well as assessments of their usage profiles, is used to modify and redesign the systems.

A stakeholder is defined as a person or group who is able to have an impact on the eventual system in a practical sense (Coakes & Elliman, 1999). By this definition one has to include all parties who can affect a system, whether their traditional roles and responsibilities are enhanced by the system or depreciated. The information systems literature has subtle variations on the notion of a stakeholder (Alter, 2000). One difference is that most researchers consider a stakeholder to be one (individual or group) who is affected by a system. We feel that this difference, though subtle, is important for identifying the stakeholder groups for e-government systems.

It is important to define a stakeholder in an e-government system on the basis of their relation to the system-those who demand the services versus those who supply the services. Supply-side stakeholders provide the services either from within the government or as agents of the government, and include all those who have a role in the initiation, planning, analysis, design, implementation and maintenance of the services. Demand-side stakeholders are those who are recipients of e-government services and who have complex requirements, constraints and (usually) limited resources. Demand-side stakeholders may be included in the life cycle of the design and maintenance of the e-government systems but their principal role is as paying or non-paying consumers who determine the fate of the system by their levels of consumption.

Figure 1 depicts both types of stakeholders for the Bhoomi system. On the left are the supply-side stakeholders with the ones in the innermost rectangle closest to the Bhoomi system. Those in the outer rectangles are further away from the actual functioning of the system but have contributed in some way to its implementation and running. On the demand-side the farmers are closest to the system. Others, such as banks and courts rely on Bhoomi certificates produced by farmers and, as such, are second-order users of the system.

Barring the Revenue Department, none of the entities on the demand side of the figure were involved in the design and implementation of the Bhoomi system. This is not unusual in the implementation of e-government services in India. Citizens, consumers, and user groups are rarely involved in the requirements analysis phase of the development. In Bhoomi's case the entire system was planned and delivered in a "top-down" manner with the Secretary of the Revenue Department as the champion and motivator for the entire project.

Second-Order Effects

It is widely known that the impact of information systems has to be assessed not only from the first-order

Figure 1. Stakeholders in the Bhoomi Project
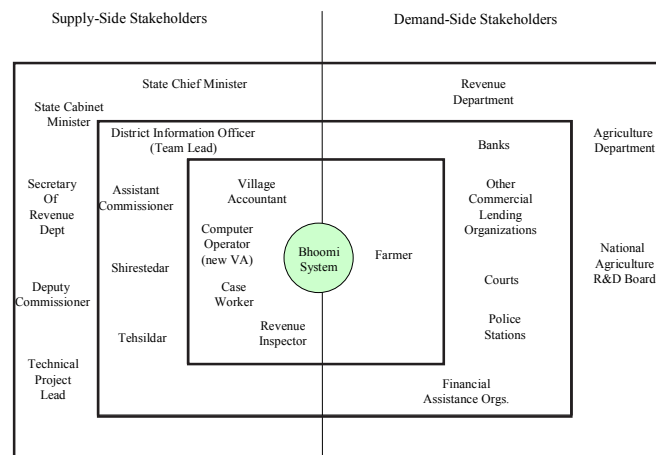
effects, such as the speed of transactions and the saving in direct costs of transactions, but also from the second-order effects that are produced by the introduction of powerful infrastructural and enabling technologies. In the debate over the productivity of information systems, (Brynjolfsson & Hitt, 1998; Dewan & Kraemer, 1998), the long-lasting effects of information technologies was highlighted and the nature of second-order effects was delineated.

In LDCs, in particular, these second-order effects are significant and, in some cases, highly desirable. De Soto (2000) argues that there is a vast amount of capital in LDCs that remains unrecognized and therefore unused. One aspect that distinguishes developed countries is that they have taken every measure to account for all their assets that has been turned into productive capital. In LDCs there exists a large amount of "dead" capital that remains invisible and unproductive. One of the effects of systems like Bhoomi in India is that they will enable unlocking of dead capital. With computerization and easy availability of records, productive assets can be accounted for and deployed more usefully.

In a survey conducted by an independent agency (Lobo & Balakrishnan, 2002) it was reported that most people who purchased their land records from the Bhoomi kiosks used them to apply for loans from banks. With the easy availability of these land records, also with more up-to-date information about cropping and harvest, farmers find it easier to apply for loans from banks.

The Problem of Incentives

One of the important goals for setting up e-government initiatives in India and in other LDCs is to reduce corruption in government services. Bhoomi's impact on this has been quite impressive. The PAC report stated only about 3% of the respondents reported having to pay bribes to obtain a land record, and this figure was down from about 66% that had to pay bribes with the manual system. Even the quantum of bribes has been reduced by the usage of the computerized system. A significant impact has been in the land mutation process, which has traditionally been the most time consuming, where every request for mutation entered into the system is logged into a pendency report that is scrutinized carefully by the managers in charge. If bribes are paid to move the request within the queue, which used to be the case in the manual system, the system forces the corrupt employee to quickly serve the pending requests earlier in the queue to get to the one to be expedited.

The problem of incentives is modeled by Banerjee (1997) where it is shown that the lure of corruption works where there are consumers of government ser-

vices who have differential capacities to pay. Focusing on LDCs, the author argues that when the government awards service slots to bureaucrats to allocate efficiently, depending on the policies that they follow, bureaucrats may introduce inefficiencies, red tape and corruption. In particular, welfare-oriented governments are more prone to suffer bureaucratic red tape and corruption as opposed to profit- and market-oriented governments.

Many argue that Bhoomi's ability to reduce and keep in check corruption is limited and not likely to last. As the system is new, the attendants and petty bureaucrats have not yet understood how to work the system to their advantage. The survey revealed that 78% of the users never saw a bureaucrat while using the system (Lobo & Balakrishnan, 2002). Bhoomi has distanced the bureaucrats from the users but as more services are provided via Bhoomi kiosks, as is planned by the government, this distance will narrow and the possibility of red tape and corruption will follow.

FUTURE TRENDS

A deeper analysis of the problem is required to assess whether indeed Bhoomi's system of delivering land records will again suffer red tape and corruption. Corruption is not reduced with large incentives given by the government to the bureaucrats to perform. So, even though Bhoomi's performance is very strong, with several hundred thousand records being purchased every month, there is no guarantee that enhanced services provided via Bhoomi kiosks will not introduce red tape and corruption.

Second-order effects are prominent in e-government systems and have to be included in their assessment. Demand-side stakeholders determine the second-order effects which finally determines the usage levels of the system. Supply-side stakeholders are affected by issues of incentives, wherein their motivation and reason to improve efficiencies or to increase red tape and corruption are determined by the policies governments follow while providing services. These points require further study and analysis and remain objectives for future research.

CONCLUSION

A review of the literature on the assessment of e-government systems revealed many approaches to assess both the process of implementation of systems and the performance parameters. The approach in the literature is to identify process and design models and frame-

works by which effective e-government systems can be realized. The literature does delineate LDCs from developed countries in the manner and approach by which systems development is conducted. Hence, some key ingredients for the success of systems in LDCs is missing. Three factors were identified, namely: analysis of the stakeholders, second-order effects and the problem of incentives, as crucial for assessing e-government projects. Stakeholders for large systems development projects may be categorized both on the demand side and on the supply side. For the Bhoomi system, demand-side stakeholders were not included in the analysis, although, for other projects such an inclusion would be mandated as the stakeholders finally determine the fate of the system.

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KEY TERMS

Dead Capital: Assets owned by a nation or state that remain un-recognized and un-accounted for, thereby preventing their productive deployment.

Demand-Side Stakeholder: A person or agency who is desirous of the services offered by any e-government system and who will have an impact on it in a practical sense.

E-Government: Government's use of information technology to introduce efficiency and transparency in its own functioning and in its service offerings to citizens.

Incentives: Attractive inducements offered to providers of services to be more efficient.

Red Tape: Pointless bureaucratic procedures that citizens have to endure while dealing with government agencies.

Second-Order Effects: Indirect and long-term impacts of e-government systems on the economy.

Supply-Side Stakeholder: A person or agency that is responsible for offering e-government services and who will have an impact on its design and functioning in a practical sense.

Assimilation by Communities of Internet Technologies[*]

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INTRODUCTION AND BACKGROUND

Information and Communication Technologies (ICT) are posing fundamental questions for society, government and commerce in economic, social, educational, cultural and democratic processes within and across nation states in terms of access, equity and security. Electronic networks which can operate both inside and outside of nation states with hitherto unknown volume and velocity are challenging and changing the architecture of governance, power and culture (Bollier, 2003; Coleman & Gotze, 2002; Rheingold, 2004).

Many governments and global agencies have recognised the growing issues associated with inequitable ICT access and have provided funded programs aimed at addressing specific needs within nation states. However, there is growing evidence that many of these programs have failed to deliver on their desired aims and that the societal and community-based disadvantages resulting from uneven societal adoption of ICT are growing (see for example, Pigg, 1998; Hewitt & Pinder, 2003; Clement, 2000; Gurstein, 2003a, 2003b). There is now increased understanding that the provision of ICT access, either high or low capacity, through government and private sector efforts by itself is insufficient to address the substantial concerns that face society as a direct result of ICT (Gurstein, 2003a; Pinder & Hewitt, 2002).

Further, growing experience across the world in the application of ICT in the provision of government services (known as e-government) is showing that the electronic provision of government information and service as for example, through currently available physical ICT access within particular communities, does not appear to be sufficient to meet the broad challenges governments must address for individual societies to move forward in the information economy (Hewitt & Pinder, 2003). In almost all jurisdictions across the world, the take up of electronically enabled government services has been well below expectations even in situations where there are high levels of income, education and Internet connection across populations (Bertucci, 2003; Dutta, Lanvin & Paua,

2003; Riley, 2003a; Rohleder & Jupp, 2003; West, 2003). Fundamental to these issues is the recognition of concepts of:

- *Effective use* as opposed to *access* (whether this is based around physical, attitudinal, educational, disability, cultural, or integration concepts)
- *Civil Society* and a new contract that binds civil society, public and private sectors into a value matrix (Brussels-EU Chapter of the Club of Rome and Factor 10 Institute, 2002)

These issues provide substantial challenges for the traditional and familiar forms of governance and business education, as well as for issues related to the form and function of service delivery and forms of engagement with citizens, the private sector and civil society. The traditional incrementalist and efficiency-based approaches within specialist agency structures are now under pressure from increasingly ubiquitous ICT applications that have little respect for professional, organisational, nation state, social or cultural boundaries.

In recognizing these issues and their impacts on the developing world, the United Nations (UN) through the International Telecommunications Union (ITU) delivered the first World Summit on the Information Society (http://www.itu.int/wsis) in Geneva in December of 2003. Fundamental to this event and the planning for the next WSIS in Tunis in 2005, is the recognition of the concept of civil society alongside business and government as a triumvirate to deal with the huge problems of inequity that ICT poses across the world. In defining responsibility for civil society, planning processes have clearly defined higher education as an essential leader.

THE EMERGING CONTEXT FOR SOCIAL APPROPRIATION OF ICT

ICT are simultaneously both incrementally and fundamentally changing the working, social and personal lives

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of many people in developed countries and developing countries alike. The technologically deterministic view of ICT diffusion, particularly in the development of e-government, is now being challenged. As the many examinations of "e-readiness" are finding, the major current impediments to adoption of e-government are in the demand and the aggregation of supply and demand domains. Many of the ICT applications developed for organizational use have not been successfully embedded into the demand and demand aggregation domains and are being found wanting in such areas. Hence the social appropriation of ICT refers to the duality of redefining application design and of embedding the technology in social processes in civil society (for example, see Surman and Riley, 2003). In short, it is about customer-driven technology.

In beginning to examine the emerging frame for ICT in a societal sense as opposed to through a technology or organizational-efficiency lens, it is useful to consider the comparatively recent evolution of Information Systems (IS) as a discipline and its alignment with Management Information Systems (MIS). This can then act as a basis for examining the emergence of Community Informatics Systems (CIS) and Civil Society (CS) as a key area of the Information Society. IS has been the overarching term used to describe the information software systems used for organisational applications. The traditional discipline of Information Systems is currently undergoing a major evolutionary step into societal applications, as opposed to organizational applications in business, education and service delivery. Harris (2002) has proposed a discussion framework for the emergence of Information Systems as a discipline (see Table 1). While the time frames therein can be considered approximate, depending upon location, and the descriptors used are unnecessarily prescriptive, Harris does, nonetheless, chart a development base for Information Systems as a discipline. The point that the Information Systems discipline is now increasingly moving outside of organisational boundaries and into society

is also made. This society domain is much more difficult to define in terms of both form and function at the operational level. In doing so, Information Systems is mixing with hitherto separate and unfamiliar disciplines that include community engagement.

The term Community Informatics (Gurstein, 2000) has recently emerged to describe the use of ICT for local community benefit and more recently, international researchers and funding agencies have moved towards the term Community Informatics Systems (CIS) as a parallel for Management Information Systems (MIS). CIS is an emerging area of practice, teaching and research that fits within an Information Society framework alongside the more traditional areas of Business, Technology, Government service delivery and Contemporary Communication. There are several very distinct differences between MIS and CIS approaches. Community Informatics Systems focus on distributed systems and not aggregated ones. CIS favours collaboration over competition and sharing over hoarding. CIS is based on a premise of active interaction in the development, use and appropriation of the systems, compared to MIS which is predominantly based on a passive consumption of service offerings (Gurstein, 2003b).

THE ROLE OF HIGHER EDUCATION

There have been increasing calls over recent times for Universities to recognise their responsibilities in regard to life-long learning in their communities (Cumpston et al., 2001; Garlick, 1998; Gronski & Pigg, 2000; Harkavy, 1998; Nyden, 2001; Rice, 1996). In particular, there is discussion on the role of higher education in providing capacity to communities to address the imbalances between the private, public and the community sectors in the basic operations of a democratic society; facilitating an attitu-

Table 1. Information systems as an emerging discipline (Harris, 2002)

Dominant Technology	Information Systems Locus	Work group focus	Dominant referent discipline	Scope
1960–70 Main Frame Computers	Electronic Data Processing	Clerical Staff	Computer Science	The Organisation
1970–80 Mini-Computers	Management Information Systems	Managers	Management	
1980–90 Personal Computers	End User Computing	Knowledge Workers	Organisational Behaviour	
1990–2000 Networks	Strategic Information Systems	Shareholders	Economics and Marketing	
2000 The Internet	**Community Informatics**	Citizens	Social Science	**Society**

dinal change in graduates towards community service, and in aligning some of their research programs to address "real" issues confronting particular communities (Garlick, 1998; Gronski & Pigg, 2000; Harkavy, 1998; Nyden, 2001; Nyden et al., 1997; Schuler, 1997, 2001). Underlying these issues is a fundamental challenge to Universities to revisit the issues of plurality and local relevance from whence many of them have come (Rice, 1996). CI goes to the very heart of these above-mentioned calls because effective communication at the community level is the collective base for learning which combines science with practice as an essential core component. In recognition of the importance of readdressing this leadership vacuum in the United States, more than 850 Universities have joined the University Compact (http://compact.org) with the overarching aim of building social responsibility into teaching and research in order to better equip their graduates and society for an increasingly positive engagement in shaping their collective community futures. The social appropriation of ICT quite clearly has a very important role in achieving these aims and is vital to effective self-reliance in the developing world. Such matters are increasingly being recognized across the developed and developing world, including significant examples of University/Community partnerships for the social appropriation of ICT and Community Informatics research to determine the key issues that will allow communities to become more self-reliant in the digital realm that exist in both situations.

The work of the COIN Internet Academy (http://capricornia.org) and the Centre for Community Networking Research (http://www.ccnr.net.a*u*) in Australia, the Canadian Research Alliance for Community and Innovative Networking (http://www.cracin.ca), the Community Network Analysis project in Brighton UK (http://www.cna.org.uk/) are examples of the research-based approaches that a number of Universities are taking to examine the social appropriation of ICT and Community Informatics. Such activities form the basis of the Community Informatics Research Network (http://www.ciresearch.net), which involves more than 200 researchers from more than 20 countries that coordinate, share and develop useful research that will complement the enormous energy that has been applied to the *organizational* appropriation of ICT in government and business across the world.

KEY ELEMENTS IN THE SOCIAL APPROPRIATION OF ICT

Taylor (2004) shows key elements for CI policy, praxis and research:

- ICT competency as an essential life skill
- Trust
- Discontinuity of ICT adoption
- Collaboration of civil society, government and business sectors
- Perceived relevance
- Information granularity
- Spatial dimension
- Assessment, policy and research

In preparing for the next phase of the emerging ICT-enabled environment, a new social contract is required that binds and partners civil, private and public sectors in delivering social inclusion and social cohesion in ways that strengthen economic, social and cultural benefit in the information society.

In the context of the Information Society, as defined by the United Nations and its related international bodies and task forces, the emergence of a construct of civil society is clearly the preferred option for all of the significant international bodies with an interest in broad-based access to, and the effective use of ICT (Birch, 2003; Bloem, Guerra, Krebs, & Lassonde, 2004; O'Siochru & Constanza-Hock, 2003; Thompson, 2004; WSIS, 2003; WSIS Civil Society Plenary, 2003). Tentative first steps have been taken in this regard in Australia with the formation in 2003 of the Roundtable for Australian Civil Society (RACS, 2003) to develop and deliver a statement from Australian Civil Society to the World Summit on the Information Society (WSIS). Equally in this context, Governments should aim to achieve the considerable public value which could be realized from representing themselves as *members of networks* instead of *levels of hierarchies*.

In putting forward such a distributed agenda of participation and involvement, there is a need for both a recognisable *form,* through a visible and supported structure, and *function*, through a distributed research and policy development capacity. Such a forum/academy should sit alongside government and act as:

- an open channel for discussion
- a primary developer of relevant inputs to policy
- a coordinator and evaluator of research, and
- an alliance builder with relevant international efforts.

This approach will provide the means to continually advance a "joined up" agenda which recognises the needs of various societal layers or segments, the value of participation in gaining increased effective use of ICT and the high costs of retro-designing for ubiquitous electronic interaction.

THE VISION FOR CI AT CAPE TECHNIKON

Cape Peninsula University of Technology has established a Business Applied Research Centre (BARC) to align its research energies and graduate competencies with national and regional business and community needs. Under the umbrella of a (South African) National Research Foundation (NRF) research niche area for e-commerce in Small Medium and Micro Enterprises (SMMEs), many projects are running, including those in the fields of health informatics for Small/Medium Medical Practices, success metrics for e-commerce SMMEs and adoption of e-commerce by SMMEs. These projects are clearly aligned with a Community Informatics theme for empowering local communities using Information and Communication Technologies (ICT). The new initiative in joining and contributing to CIRN will supply strong focus on the emergence of ICT into civil society issues, such as poverty alleviation, policy formulation and reduction of unemployment. These efforts will attract partners throughout Africa.

Another CPUT initiative called e-iKamva has already begun as a pilot project to provide access to skills training and technology for disadvantaged residents of Cape townships as a step towards economic self-sufficiency from small business operation.

The large group of researchers in CIRN (Community Informatics Research Network, internationally and now in Cape Town) will work with Cape Peninsula University of Technology to create a model Community Informatics post-graduate curriculum suitable for Masters and Ph.D. students, as well as short courses in CI for community practitioners and policy makers. The process of development of the curriculum will be one which both transfers international experience (research and practice) and works with local communities and community technology practitioners to reflect local needs as understood and articulated by the diverse range of local South African communities as they are given an opportunity to engage with and appropriate ICT.

The developed curriculum and student learning will link into a range of community-based technology initiatives within a context of Community Informatics research. In this way student learning will both incorporate the highest level of academic/professional content and a direct experience and involvement in community-based technology practice. The development of these programs will be sensitive to the requirements for community-specific cultural, linguistic, and gender applications.

An element of this approach will be that CPUT students will have access to a range of learning and research opportunities both directly and electronically mediated with the other centres worldwide currently active in the CIRN network. Staff and student exchanges on community-based projects and research will be targeted.

Among the areas that will be included in CPUT's CI approach are:

- community research methodologies
- approaches and methodologies for CI sensitive policy analysis and development
- the development of contextual community responsive technology, and
- strategies for effective use of ICT within a community practice context.

Other significant aspects of the community informatics approach include the development of strategies for the analysis of community and social requirements for designing community-based processes of technology appropriation and planning, technology program planning and outcomes evaluation research. The Community Informatics Research Network (CIRN) will help form a platform for CI to become a community-focused research hub at CPUT.

Partnerships with government, civil society, business and industry are being sought to develop this CI focus for the empowerment of local communities via ICT using BARC and other bodies as vehicles. Cape Technikon and Peninsula Technikon were merged in January of 2005 to form the Cape Peninsula University of Technology (CPUT). Community Informatics will form a strong central component of CPUT's future vision. The purpose of a University is to protect and develop society by producing active, skilled citizens with adaptability and entrepreneurial approaches. Community Informatics supports this purpose directly.

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KEY TERMS

Community Informatics: Community Informatics has been defined by Gurstein (2000)[3] as using ICT to help communities achieve social, economic, political and cultural goals. It is about the social appropriation of ICT for local benefit, empowerment and participation in decision making.

Digital Inclusion: Digital Inclusion is the obverse of "Digital Divide" and seeks to proactively focus on including people in the use of ICT for local and personal benefit either directly or through distributed application of information, knowledge, practice and process derived from such technologies. Whilst many examples of such an approach exist, some appreciation of such an approach can be found through the Salzburg Seminar on Digital Inclusion (http://www.salzburgseminar.org/sessions .cfm?core_id=558&core_group=asc),the work of the Digital Inclusion Institute (http://www.digitalinclusion.net) and the Mistica project in the Caribbean (http://www.fundres.org/mistica/english/project/).

Social Appropriation of ICT: This refers to the process of exploring and adapting ICT so that it can be assimilated into everyday social practice. The concept has been explored by Surman and Riley (2003)[1]; where they posit that *appropriation* is third step following *access* and *adoption* of ICT. Appropriation involves the process of turning the technology to individual or collective use, modifying it and "owning" it. A theoretical basis for the concept can be found in the Theory of Adaptive Structuration[2] which is modification of Giddens' original Structuration Theory. Appropriation occurs when an individual fits the technology to their needs and sits

opposite disappropriation which is when individuals decide the technology is no longer of use. The Social Appropriation of ICT recognizes that appropriation in a social or community sense is different to that which occurs in an organizational setting.

University Outreach: University Outreach refers a long established concept of applying knowledge gained from research and academic endeavours in a community, social or business setting. It has a long established tradition in agricultural extension and more recently has emerged in concepts of service learning[4], the new scholar[5] and higher education's social responsibility

ENDNOTES

[*] This article is based upon an article that appeared in the inaugural issue of the *Journal of Community Informatics.*

[1] Surman and Riley (2003). Appropriating the Internet for Social Change. Social Science Research Council, Canada. http://www.ssrc .org/programs/itic.

[2] See DeSanctis and Poole (1994). Capturing complexity in advanced technology use: adaptive structuration theory. *Organizational Science* 5(2), 121-147.

[3] Gurstein, M. (2000). Community Informatics; Enabling Communities with Information and Communication Technologies. Idea Group Publishing. Hershey, USA. P3

[4] See http://www.compact.org

[5] Rice, R. E. (1996). Making a place for the new American Scholar. AAHE. Washington DC 20036.

Building a Framework for the Development of RMIT Learning Networks

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INTRODUCTION

Learning networks is a unit within Community & Regional Partnerships (C&RP) at the Royal Melbourne Institute of Technology (RMIT University). Community & Regional Partnerships (C&RP) is charged with enacting RMIT's mission to "make a difference" in the world and be "engaged, partnered and creative in supporting individuals, enterprises and communities."[1] C&RPs work is to establish, broker, facilitate and monitor sustainable partnerships between our stakeholders and the university and to build capacity in the university to enable the knowledge society and civic participation.

Making a difference in communities is really about community engagement which is an increasingly common term used by Australian Universities to describe teaching, research and service activities that are more "responsive" to the needs of industry and communities. Within the literature are discourses about social capital, sustainability, community development, community partnerships, networks and regional engagement (Crittenden, 1997; Duke, 2002a; Marginson, 2002; Watson, 2003). The development of RMIT Learning Networks over the past five years happened while the debate about the role of universities in communities had been taking place. RMIT Learning Networks began as a Technical and Further Education (TAFE) funded project—a Victorian Learning Network, one of ten projects across Victoria commissioned with implementing online learning programs in various community locations. The aim of the project was to trial immediate options for increasing the State Training Service's capacity to provide responsive quality training through flexible delivery arrangements that included the use of the Technical and Further Education Virtual Campus (TAFE VC[2]) and online technologies (OTFE, 1998). The RMIT project, RMIT LearnLinks, was successful in competitively tendering for three funding rounds and has now evolved into an access and equity partnership between RMIT University and six Adult, Community Education (ACE) Centres.

As a practitioner researcher, Leone Wheeler used an action research approach to investigate RMIT LearnLinks over three funding cycles from mid 1998 until 2002. The project was used as an instrumental case study in order to gain an insight into a broader issue, that was, the common elements of an operational framework required for a sustainable learning network (Stake, 2000). In other words, how could this project be made sustainable within the confines of a University context, especially when the additional Government project money ceased?

This was a common problem for these types of projects, whether they were within a University context, or run entirely by community organisations. In the last few years both locally and internationally there have been an explosion in projects and initiatives that involved partnerships, community development and information and communication technology with considerable amounts of money invested. These projects are defined in a number of ways, for example, "community learning networks", "flexible learning networks", community networks, "learning towns", "community information networks", "learning communities" and are often not well defined (Denison, Hardy, Johanson, Stillman, & Schauder, 2002). Many of the projects are reliant on short-term funding and when the government money runs out sustainability is an issue. Long-term sustainability of these types of projects and justification in terms of intangible benefits to the community have been identified as two of the biggest challenges faced by organisations who support these projects (DCITA, 2003; Kirby, 2001; Schuler, 1996; Sellar, 2002).

Wheeler systematically collected data over a four-year period of running RMIT LearnLinks. This included previous research (Wheeler, 1997); literature reviews, business documents, interviews with international experts and practitioners, interviews with all key stakeholders (ACE coordinators, RMIT staff and funders) and collaboration with community and University stakeholders through annual review days and the use of two key informants who helped develop the operational framework. Also a senior strategic consultant in vocational

education and training (VET) was appointed to advise on dealing with organisational systems and processes within the University.

THEMES

The key themes that emerged as a result of analysing the data were as follows.

Learning Network Lifecycle

The implementation of an operational framework for a learning network went through a lifecycle that involves phases. The phases were labelled establishment, consolidation and enhancement. Particular actions were carried out at each of these phases. The enhancement phase was also the time to consider reducing the dimension of the program or exiting. As the RMIT Learning Network team took on more projects, each phase became more refined, and we were able to take on new projects and with larger organisations. The development of phases and lifecycles is common in community building projects (Beilharz, 2002).

Partnerships

The majority of time in the establishment phase of RMIT LearnLinks was in the development of trust and building relationships (Phillips, 2000). This is relevant to other types of community building projects (Cara & Ranson, 1998). Himmelman (2001) categorizes partnerships as a continuum from networking through to collaboration. At one end of the continuum is networking which involves the exchange of information for mutual benefit and at the other end is collaboration that enhances the capacity of the other partners for mutual benefit and a common purpose. RMIT LearnLinks, after five years of operation, is now at the collaboration end of the continuum.

Capacity Building

Capacity building for RMIT Learnlinks was viewed in terms of building the human capital skills of the teachers and managers involved in the network and building social capital through the development of the know-how, trust, networks and shared value of the members of that network (Faris, 2001). The majority of the stakeholders that were interviewed said that this was the most successful part of the project. This was on two levels. Firstly, the subsidized professional development programs that were offered to teachers and managers. This included accredited programmes about teaching and learning online, scholar-

ships to undertake Masters of Education, through to short courses in a range of relevant areas to do with teaching with technology. Secondly, the building of networks across the partners in the project was also beneficial. In particular, the links to broader opportunities, for example, some community partners talked of the opportunities of linking into online teaching and learning via the TAFE VC. One community partner talked about the opportunity of tapping into broader networks and specifically referred to being able to hear Dr. Ron Faris talk about the development of learning communities in Canada when he was out here as a guest of RMIT Learning Networks as part of the RMIT International Fellowship programme in 2002. Others talked about the growing collaboration between community partners that enabled them to collaborate on other projects that involved teaching and learning with technology.

Sustainability

Sustainability was the "hot topic" of the interviews with stakeholders who were part of RMIT LearnLinks. The majority view was that beyond the Government funding this project would not be sustainable. Most community partners said that the additional money they received as part of the project for the purchase of information technology (IT) equipment and the building of capacity through professional development and online content projects was very useful and they did not see how they could continue on a service agreement arrangement. However, community partners and RMIT Schools voted to continue the project when funding ran out at the end of 2002. It was a very much down-sized project based on brokering accredited training into six community locations. The program is now linked into the recurrent funding provided by the state government. The community partners use the training hours provided to either value add to work they already do or to extend what they can offer to their learners. The University requires the community partners to target concession learners in a community setting, thus contributing to access and equity targets and managing diversity. However, technology is no longer a focus, apart from keeping the website up-to-date, with periodic newsletters of what is going on. The research into the development of an operational framework for a sustainable learning network found that sustainability could be viewed on a number of levels. The level that was appropriate to RMIT LearnLinks was financial viability at the program level. This was defined as the long-term ability of the program to maintain or improve its capacity to deliver services and is based on a definition used to investigate the sustainability of community technology centres in Seattle (O'Malley & Liebow, 2002). For example, as long as the

community partners and RMIT Schools wanted to and the University provided funding via student contact hours, the network reached a sustainable level.

On the next level was RMIT Learning Networks (RLN) as a business unit within Community & Regional Partnership (C & RP) group within RMIT University. The same definition of sustainability also applied to RLN as a business unit for all its programs and services, that is, it is the long-term ability of RMIT Learning Networks to maintain or improve its capacity to deliver services.

Once sustainability of a community engagement project was achieved at a program and organisation level, then sustainability at the macro level could be investigated. How did a particular partnership project contribute to the creation of a sustainable learning community in a particular geographic region as described by Faris (2003)? There are a number of ways the contribution a community engagement project makes to building the capacity of communities to engage with education can be measured. It is about measuring the contribution these projects make to the knowledge, skills and attributes required for economic growth and the building of social capital. Most of the studies indicate these results are best measured over a long time period (Black & Hughes, 2001; Faris, 2003). However, it was outside the scope of this investigation to use these evaluation methods for this study. This is an area for further research.

OTHER PROJECTS

As the RMIT LearnLinks project came to the end of its outside funding cycle and joined University mainstream funding the team looked at other ways to build on the learning. The university provided funding to undertake another similar partnership project—*whereveruni*. This is a partnership with the Salvation Army and RMIT University with the aim "to take people who are marginalised from learning and from social participation and excite these people to realise the possibilities that lay within them through an educational experience which is facilitated by technology". The project has now been incorporated into a partnership with The Smith Family, supported by Microsoft and the Victorian government to investigate the development of a scaleable learning network that focuses on youth and their families. This pilot known as the *i.can.connect* project aims to assist local communities develop non-formal learning options to help marginalised and disadvantaged people bridge the "digital divide". The Smith Family are also linking the learning from this project into a Microsoft project called Unlimited Potential, which is a global program focused on improving lifelong learning for children, young people and adults by providing technology skills through community-based technology learning centres (CLTCs).

Cheryl Lewis-Fitzgerald, the RMIT Learning Networks Project Manager for *whereveruni* and *i.can.connect* is documenting the work of *i.can.connect* in a Masters of Education. In particular her focus is on the learner in the non-formal learning milieu. That is, the factors that enables participants to develop an enthusiasm and confidence of learning as well as being non-formal, flexible, and self-paced while focusing on individual needs.

This research is investigating the strategies, characteristics and philosophy of the non-formal learning milieu, which is used in a range of learning opportunities provided by *i.can.connect*. This includes Computer Clubs for young people, and the *whereveruni* program for adults. Both use non-formal methods and information and communication technology as a way of engaging young people and their families back into learning. The results of this research will inform future trainers involved in unlimited potential to ensure its ongoing success.

Lewis-Fitzgerald is tracking at least three unique phenomena that she believes occurs in the non-formal learning milieu, that is praxis, unanticipated learning and the development of a learning-centred environment (Crawford, 1995; Freire, 1996; Levine, 1995; Ward, 1995). From the data collected so far she has identified that the following factors are important:

- dialogue/feedback (with trainer/s and other participants)
- motivation/reward/empowerment
- practice
- safe environment/trust
- achievement of personal goals.

This work is in progress and more detailed results will be available in 2005.

Schön (1983) said that by encountering certain types of situations again and again a professional practitioner develops a repertoire of expectations, images and techniques. The practitioner learns what to look for and how to respond to what he/she finds. Schön (1983) said reflection-in-action was a way for a practitioner to frame a problem one was attempting to solve. It was thinking in action about the spontaneous, intuitive performance of actions of everyday life. It also encouraged a practitioner to take on harder projects next time round. The knowledge base developed within the RMIT Learning Network team is also contributing to the development of two clearinghouse projects, that is, the development of a community building clearinghouse for the Department for Victorian Communities and an international Observatory on Place Management, Social Capital and Learning Regions (Observatory PASCAL).

The Framework

The framework for developing the business within RMIT Learning Networks is based on an action learning and action research approach (Zuber-Skerritt, 2001). A cycle of planning, action, observation and reflection is developed for each project. The learning from a project is pooled into a knowledge base and that is used to plan the next project.

The evolving work of RMIT Learning Networks translates into an overall aim to work through information and communication technologies (ICT) to develop learning communities built on partnerships between community, government, business and educational organizations and by reflecting on this work this has now been incorporated into the following statement about our future work:

To develop and enhance products and services that promotes and draws on practitioner research. This informs and advances RMIT University's knowledge and understanding of sustainable communications based learning communities. We work through partnership with regions, alliances, networks and clusters. Our work contributes to an overall vision of educational, civic, economic and social transformation.

This is further represented in an action research cycle in Figure 1.

In conclusion, Universities can play an important role in community engagement projects. The knowledge gained influences teaching and learning, research and innovation and community engagement strategies. It is a way that Universities can enrich and empower the communities and regions in which they operate. It also enables the University to foster a learning organisation approach. However, it is not without its challenges, the greatest being justification for undertaking these projects and the ongoing financial commitment to such projects, especially when initial project funding stops. The team at RMIT Learning Networks found it important to have a clear goal of type of community engagement, to focus on partnerships with NGOs, corporations, universities and others that have similar goals, to build on the knowledge base and at the heart of the work to focus on the learner.

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Figure 1. RMIT Learning Networks action learning/ action research cycle

Research
- Learning Networks
- Community Building
- Building Social Capital using ICT as an enabler
- Learning Communities
- Non-formal learning methods, eg, learning circles
- Practitioner research using Action
- Learning and Action Research and a case study approach

Operational Projects
- Community Building Resource Service Clearinghouse (CBRS library)
- International Observatory on Place Management, Social Capital and Learning Regions (PASCAL)
- RMIT LearnLinks
- whereveruni and Unlimited Potential

Products/Services
- Community Building Resources
- Professional Development
  o online facilitation,
  o learning circles,
  o information searching

Potential and Established Partnerships / Alliances / Associations
- ACFE-NMR
- Adult Learning Australia
- Australian Learning Communities Association
- Buloke Learning Towns
- Office of Training and Tertiary Education
- Salvation Army
- The Smith Family and Microsoft
- University of Stirling, Scotland and other partners in PASCAL
- The Department for Victorian Communities
- Victorian Learning Communities Network
- Internal
  • Academic Portfolios
  • University Library
  • Teaching and Learning Strategy Committee
  • Department of Social Science and Planning (Research Partner for PASCAL and CBRS)

COMMUNICATION BASED LEARNING COMMUNITIES

B

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KEY TERMS

Community Building: This is a process whereby communities, government, business and philanthropy work together to achieve agreed social, economic and environmental outcomes. It works by government listening to what local people believe could improve their community and sharing ideas about how these changes can be achieved. Community building can be relevant to any community but often targets communities that are characterised by inequity and disadvantage (DVC, 2004).

Community Engagement: An increasingly common term used by Australian Universities to describe teaching, research and service activities that are more "respon-

sive" to the needs of industry and communities. It can cover discourses about social capital, sustainability, community development, community partnerships and networks, regional engagement and so forth (Crittenden, 1997; Watson, 2003).

Community Learning Network: Community-controlled structures and systems aimed at furthering community development and enhancing the lives of their constituencies by supporting and encouraging lifelong learning (OLT, 2001).

Learning-Centred Environment: This environment provides the opportunity for meeting the needs of the learner because their needs may be explored, recorded and measured accordingly by direct observation, questioning or conversation (Ward, 1995).

Learning Community: A learning community addresses the learning needs of its locality through partnership. It uses the strengths of social and institutional relationships to bring about cultural shifts in perceptions of the value of learning. Learning communities explicitly use learning as a way of promoting social cohesion, regeneration and economic development that involves all parts of the community (Cara & Ranson, 1998).

Learning Network: A cooperative of education providers working together to provide Tertiary and Further Education (TAFE) and Adult, Community and Further Education (ACFE) programs that are accessible via the Internet (OTTE, 2002). People within the network used computer mediated communication to work and learn together, at the time, place, and pace that best suited them and was appropriate to achieving pre-determined learning outcomes and targets.

Praxis: Suggests two major components, that of action and reflection. What is implied is that we should move from thinking about what has been done and how to improve it, to acting on reflections and putting those reflections into action during the program. This also involves review and improvement (Freire, 1996).

Unanticipated Learning: This usually occurs as a function of interaction and conversation between the trainer and the participants. It takes place on the way toward clear learning goals, and has significant meaning for the learning (Levine, 1995).

ENDNOTES

[1]   Draft Strategic Plan *Creating the Environment for Sustainable Business* Version 2

[2]   http://www.tafevc.com.au

Building Human–Centered Systems

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INTRODUCTION

Within the current socio-economic paradigm, in which engineering systems are key for the sustainable development (Moses, 2003), the region is considered the place of *untraded interdependencies*, meaning "…conventions, informal rules, and habitats that coordinate economic actors under conditions of uncertainty. These assets are a central form of scarcity in contemporary capitalism, and hence a central form of geographical differentiation" (Storper, 1998) and economic growth. The actors include "firms, organizations and institutions [that] interact in the generation, diffusion and use of new—and economically useful—knowledge in the production process" (Fischer, Diez, & Snickars, 2001). Some of these interactions are based on information and communication technologies (ICT) in terms of digitally-enabled knowledge networks, which have been developed through ill-defined *communities of practice* (CoPs).

In fact, Internet and other media were initially believed to neutralize the centripetal forces of metropolization, maybe even to start a global process of deurbanization (Jonscher, 1999), but (as a matter of fact) physical proximity is playing a critical role on technical change and economic development (Castells, 2001). As a consequence, regional systems of innovation are increasingly important in the global society (Gibson et al., 2003) and cities do provide energized places for contacts, ideas and creativity where tacit and explicit knowledge can be exchanged effectively through face-to-face communication. Opportunities for knowledge spillovers through social interaction are increasingly provided in urban environments, facilitating learning and increasing human capital (O'Sullivan, 2003).

Although we are still in a very early and limited stage of what Mitchell (1995) called "cities of bits", it is clear that it has become a "commonplace" to discuss the diffusion of knowledge, and the "knowledge-driven economy" in general, in close association with the introduction and use of ICT (Mansell & Steinmueller, 2000). Following recent analysis for U.S. regions, ICT are "both in and of themselves the products of innovation, as well as critical tools that create interfaces, linkage and knowledge networks between the main players in an innovation system" (McKnight, Vongpivat, & Selian, 2003). They are, nonetheless, embedded in a human context that calls for the design of human-centred systems, in terms of recognizing the importance of social and cultural shaping forces while developing, and exploiting technological systems (Cooley, 2000).

In this context, *what challenges are facing the diffusion and adoption of ICT at regional level*? And *what types of engineering systems may contribute for the mobilization of the information society in diversified environments, including catching-up regions*? These questions have motivated the work behind the present article, which has considered the development of case studies in selected Portuguese cities and regions engaged in building digital networks.

In previous articles, we have considered the development of the information systems oriented towards building networked places and argued that knowledge networks have the potential to attract and mobilize people in the information society and make public administration and markets more effective (Heitor & Moutinho, 2004a, 2004b). This helps promote learning trajectories for the inclusive development of society, requiring, nonetheless, effective infrastructures, incentives and adequate institutional frameworks across time and space (Conceição, Heitor, & Veloso, 2003). The analysis builds on the need to continuously adapt regional trajectories, both social and technological, and foster the necessary learning capacity of increasingly diversified local communities, referring to social capital as a relational infrastructure for collective action (Conceição, Heitor, & Lundvall, 2003), and creation and diffusion of knowledge.

Our previous conclusions derived from observations in different Portuguese urban areas with the ultimate goal of increasing regional competitiveness, by promoting public awareness and participation in decision-making processes. We have argued that the territory is a basic infrastructure that justifies and invites for the construction of several layers of information about cities and regions where people live, visit or do business. In addition, digital city schemes should also encourage the global legibility of the information architecture of the

territory and promote broad and informed participation in the decision-making process of the future in its entire influence area and not only within city limits (Tanabe, van den Besselaar, & Ishida, 2002).

The remainder of this article attempts to frame these aspects from the perspective of human-centred technical systems. We begin by examining some aspects of the mobilization of the information society and ICT adoption and diffusion at a regional level, making use of case studies in Portugal. Then we will continue by discussing the social and cultural shaping of information technologies. Finally, we conclude by briefly presenting a summary of our most important conclusions in terms of necessary social and technological conditions for the establishment of networked spaces.

MOBILIZING THE INFORMATION SOCIETY THROUGH DIGITAL CITIES

For the first time in human history, the urban population is matching the rural population (United Nations, 2002) (see Figure 1). While in 1950, 29.76% of the world population lived in urban areas, this value rose noticeably to 37.95% in 1975, 47.28% in 2000, and is expected to reach 60.22% in 2030. The total urban population will actually grow more than six-fold from 0.74 billion in 1950 to 4.98 billion in 2030, when about four-fifths of city dwellers will reside in less-developed regions. In fact, most of the expected world population increase from 2000 to 2030, which is expected to amount 2.21 billion new inhabitants, will be concentrated in urban areas, namely on less-

developed regions, where it will exceed 2 billion new residents. For the same period, the average annual growth rate of 1.85% for population in urban areas will almost double the annual rate for the total population of the world (1.04%). Seventeen megacities, exceeding 10 million inhabitants each, can be found in the world today.

The image of the city has evolved accordingly, from socially coherent and spatially circumscribed entities to complex juxtaposition of boundless urban processes (Amin & Thrift, 2002). In his seminal book, Peter Hall renders some theoretical visions of the urban phenomenon starting with the influential ideas of Ebenezer Howard (Garden Cities) and Patrick Guedes (Regional City) at the turn of the 19th century and developing contemporary views, including: Corbusier's cities of towers; autonomous communities; automobile suburbs; institutionalized land-use planning and its counterpart; and the city as a machine of wealth creation (Hall, 2002). But at the end of the 20th century, a new paradigm has emerged with Castells' "Informational City" (Castells, 1991). As pointed out by Susser (2002), "the restructuring of capitalism involved, first the concentration of knowledge as the source of profit and, secondly, the export of production to increase profitability", requiring "a flexible organization of manufacturing and greatly increased subcontracting, so that, as a consequence, horizontal, loosely connected networks directed by elite experts at the centre replaced the vertical integration of the industrial era."

While these visions enhance one or another aspect of the urban daily life, most agree that cities are characterized by dense and heterogeneous singularities of people and buildings in a specific place, or as proposed by Spiro

Figure 1. Evolution of world's urban and rural populations (Source: United Nations, 2002)
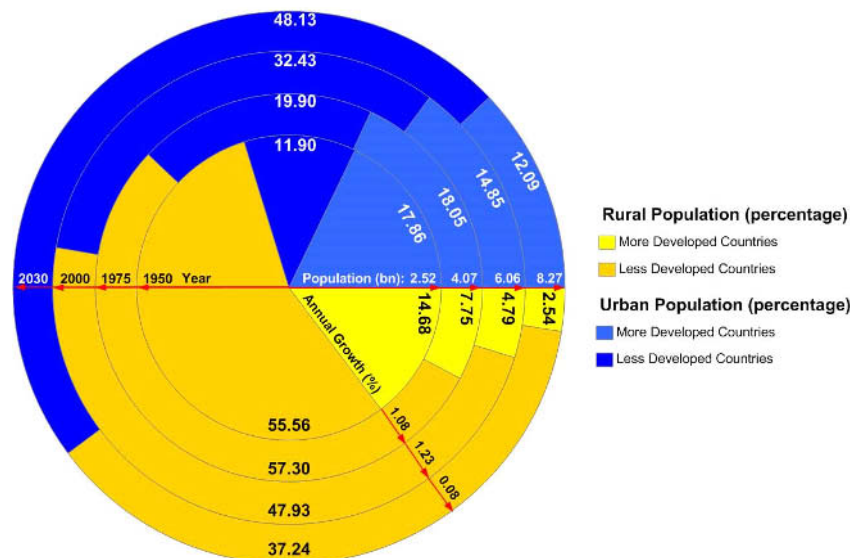
Kostof (1991), "cities are places where a certain energized crowding of people takes place". And he adds that a city has "nothing to do with absolute size or absolute numbers: it has to do with settlement density". This density, among other possibilities, increases the opportunities for social networking (Breheny, 2001), one of the main enablers of localized innovation and entrepreneurship. As pointed out by Zook (2001), "despite the space transcending ability of Internet technology, […] the commercial Internet clustered in a few regions within the United States during the period from 1994 to 2000. The existence of these agglomerations runs counter to expectations that the Internet would bring the "end of geography.""

The convergence of fresh interpretations of the urban processes and the new promises of ICT, particularly those related with virtual communities and virtual reality, created the necessary background for the development of a novel imagining of the contemporary city: the "digital city". This original concept proposes "to build an arena in which people in regional communities can interact and share knowledge, experiences, and mutual interests. Digital cities integrate urban information (both achievable and real time) and create public spaces on the Internet for people living/visiting the cities" (Ishida, 2002).

The first known "digital city" was based on Amsterdam's well-studied community network experiment in 1994 (DDS – De Digitale Stad), based on the FreeNets and Community Networks in the United States and Canada. The goal was to provide an electronic space for political discussion and participation in the ten weeks that preceded local elections. The initial success (10,000 registered users in the first weeks) quickly transformed a "grassroots and subsidized initiative [...] into a non-subsidized not-for-profit organization, with a turnover (in 1997) of about $500,000, and employing (in 1998) more than 25 persons (all together filling 17 full-time positions)". The revenues, at that period, came mainly from services like consulting, hosting, sponsorships, and advertisement. Despite the increasing number of registered users (150,000 by January 2001), the demand for these services declined steadily due to, among other factors, the ever-growing competition, and, consequently, the sustainability was threatened. The lack of funding prevented some strategic functional or technological upgrades and contributed decisively for the downward spiral that forced some of its most important assets to be either discontinued (content production) or sold (school portal, Internet access and Web hosting services) until the DDS became a stripped-down commercial Internet Service Provider in 2001 (http://www.dds.nl/). As brought out by van den Besselaar, Melis, and Beckers (2000), "…similar initiatives were undertaken in the Netherlands. Some of these failed,

while others remained much smaller, less developed, and less visible. This indicates that the success of the DDS was highly contextual, based on timing, and on the local Amsterdam cultural setting" (see also van den Besselaar & Beckers, 1998; van den Besselaar, 2000).

Another very well-known early experience was based in the "Kyoto Digital City" project, as launched by NTT and Kyoto University in 1998 aiming to "create next-generation systems for digital communities and to explore basic research issues" (Ishida, 2002, 2004). A three-layered model, strongly connected with the real city, was proposed and consisted of three layers, namely: (a) information layer (real-time data acquisition and data-bases); (b) interface layer (2D maps and 3D virtual reality); and (c) interaction layer (community building and communication). The first phase of the Kyoto Digital City was developed and housed in the NTT Open Laboratory, aiming to "promote research without restraint", and where the subjects "were discovered while doing it, the research papers were published afterwards" and the "norm was "move then think". Nevertheless, as clearly noted by Ishida (2002), this open environment failed to solve institutional issues, including research ownership, and "this misunderstanding terminated the project, which was initially supposed to run for three years, after one and a half years". Then, the Digital City Kyoto Experimentation Forum was founded in 1999, including universities, local authorities, other organizations and individuals. Its Web presence (http://www.digitalcity.gr.jp/index-e.html), the "Digital City Kyoto Prototype", provided 34 services divided in four categories (information, community, showroom, and laboratory), including personal Web sites, a georeferenced city guide (i.e., *GeoLink*, with more than 5,000 links) and a virtual representation of shopping streets (i.e., *3D Kyoto*). After two years and only 150,000 accesses, this second phase ended in September 2001.

The two projects mentioned earlier has influenced over the last decade many city developments and guide "digital city" projects over the world. However, context creation, mobilization, sustainability and adequate organizational and institutional frameworks seem to be critical while designing, implementing and exploiting digital cities (Heitor & Moutinho, 2004a) and have raised the process of looking for best practices. The question is that analysis has shown us to reject the notion of the "one best way" and that networked places need to be designed holistically, coping with change and continuously assessed in order to accommodate humanity. The following paragraphs reinforce this hypothesis by discussing Portuguese experiences in mobilizing the information society at urban and regional levels.

BUILDING THE EVIDENCE: CASE STUDIES FROM PORTUGAL

Portugal explosive urbanization rate, as indicated in Figure 2, was one of the motivations to study the co-evolution of urban development and telecommunication services and infrastructures, in terms of a knowledge-related view of the territory.

The evidence presented in this section is built on the analysis of sample projects for digital cities and regions in Portugal, which have been structured around the electronic provisioning of local government administrative services, complemented by some pilot projects in areas such as e-business and telemedicine (Heitor & Moutinho, 2004b).

The first experiences in Portugal with digital cities started in 1998 through a program jointly funded by the Portuguese Government (who contributed with 25% of the total investment) and the European Union (75% of the total investments through the European Regional Development Fund). Private investments were insignificant. The program involved 5 small and mid-sized cities (Aveiro, Bragança, Guarda, Marinha Grande, Castelo Branco) and 2 rural regions (Trás-os-montes and Alentejo), as identified in Figure 3, aiming to: (a) improve the quality of life in cities; (b) contribute to development of peripheral areas; (c) improve local economy and employment; and (d) fight info-exclusion and help citizens with special needs (MCT, 1997).

Alentejo and *Trás-os-Montes* are remote agricultural regions, among the least developed in Portugal and Europe, sparsely inhabited by an aging population. Both projects were designed to create new opportunities for the local population, mitigate social and economic disparities, promote regional networking and provide public administration electronic services to peripheral local parishes.

Aveiro is developing a true innovative and entrepreneurial image, in particular connection with the local university and the local branch of Portugal Telecom, which includes important research and development activities. On the other hand, *Marinha Grande* is particularly engaged in traditional, labour-intensive industries and the digital city project has been particularly promoted through the industrial network associated with the local moulds industry. Both these two projects invested mainly on local competitiveness and competence building.

Bragança, *Guarda* and *Castelo Branco* are peripheral cities with relative regional significance. Their approach was to support the adoption of information and communication technologies by individuals, firms, associations and local government and other public organizations.

In terms of regional penetration, the projects listed earlier covered about 11.30% of the total Portuguese population (10.44% of the population under 15 years of age) and about 42% of the total surface of Portugal. All projects involved a broad range of relevant actors and change agents within each one of the territories being nonetheless always led by local municipalities. Local higher education institutions were particularly involved only in a limited number of projects (Aveiro, Bragança, Trás-os-Montes).

It should be noted that, at least for the initial projects analyzed here, the institutional framework established by

Figure 2. Percentage of population living in urban areas for Europe and Portugal for the period 1950-2030 (estimates since 1991) (Source: United Nations, 2002)
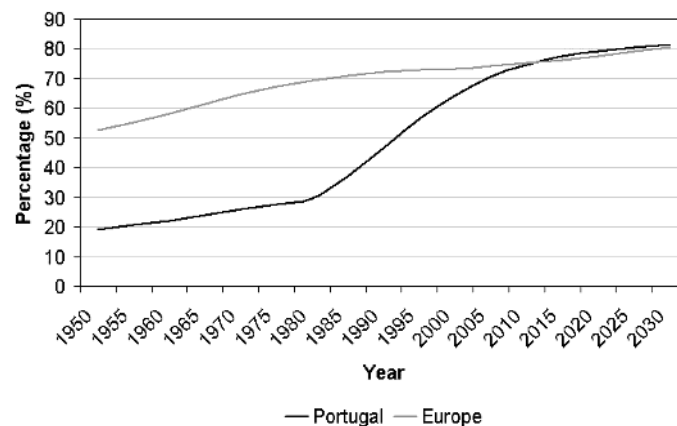
the central government was quite flexible and fostering local voluntary initiatives. It was based on the simple provision of guidelines focused on providing content and services related to local public administration and to specific activities with social implications (e.g., healthcare), economic impact (e.g., business-driven corporate networks for regional competitiveness), and aimed to promote cultural contents (Aveiro, 1998, 2001; Bragança, 2001). Initiatives to mobilize and promote the adoption of the Information Society were part of various applications, although not always considered at the required level, at least beyond that given to the implementation of infrastructures (Aveiro, 2001).

Bragança Digital focused on creating basic ICT infrastructures and wireless networking environment for local government buildings, health institutions, educational institutions, and local employment agency to provide information and services to local citizens. Other initiatives included the provision of local products (www.rural.net), health, educational and e-business activities (Bragança, 2001).

Guarda Digital was promoted by and organization formed by the municipality, local educational institutes,

Figure 3. Identification of main projects for the specific development of digital cities and regions in Portugal, as established over the period 1998-2000, making use of European structural funds (Source: Heitor & Moutinho, 2004b)
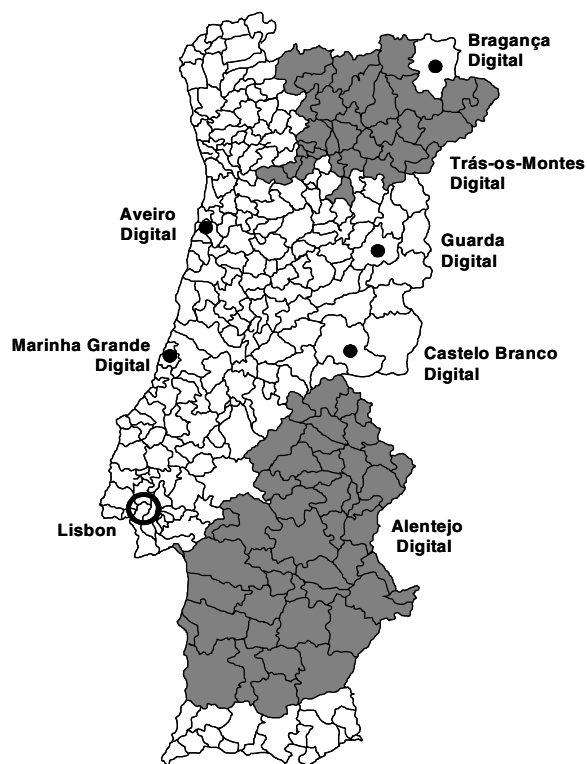
associations and the incumbent telecommunication operator. It included pilot projects in healthcare e-business, teleworking and educational initiatives (http://www.ipg.pt/adsi/).

Castelo Branco Digital aimed to connect all public institutions (municipality, social security and health institutions) and local associations (sports, culture and business) to provide an integrated information network to citizens and tourists. For example, it has included the provision in rich media of old Portuguese theatre contents (http://www.cm-castelobranco.pt/cb_digital/).

Marinha Grande Digital, as managed by the local municipality and the Technological Centre associated with the moulds and plastic injection industries, focused on creating an extranet to provide business-related (mould, plastics and glass) content and services and on facilitating communication among companies and clients. Other initiatives included a centre of advanced telecommunications to promote the use of the Internet (http://www.marinhagrandedigital.com/).

Trás-os-Montes Digital included regionally-based Web contents (i.e., www.espigueiro.pt), managed by the local Polytechnic, that aggregates content and services of 31 municipalities. The portal is still managed by the local university and includes business and employment opportunities, geo-referenced information, healthcare facilities and technologies to coordinate medical services in rural areas. An important feature of this project is the support network constituted by 84 service centers scattered throughout the region that provide public Internet access, as well as human support to help citizens' interactions with new technologies (http://www.espigueiro.pt/).

Alentejo Digital brought together 47 municipalities and three regional agencies to create a regional information network to provide services and territory-related content to citizens and local firms through regional Web-based contents. The main objective was to enable local government teams to learn, use and promote new technologies, namely computer network management and digital content production and publishing. An intranet was set up linking all municipalities and regional agencies to enable the necessary collaborative work environment. About 50 people were recruited, mostly from local unemployment lists, to work on the project that lasted until July 2001 (http://www.alentejodigital.pt/). Most of those people worked as local agents, based on each one of the town hall facilities of all the 47 municipalities involved, who proactively produced, collected or published relevant local content in the portal.

Although they did not work directly with the general public, they were a very important factor of Internet diffusion in the territory covered by the project.

Table 1. Sample "digital city" projects analyzed in Portugal (1998-2000) (Source: Heitor & Moutinho, 2004b)

Projects	Physical Infrastructures		Content (non-physical infrastructures)		Context (e)
	Networking and Connectivity (a)	**Information Systems** (b)	**Information Services** (c)	**Interactive Services** (d)	
Aveiro	Local health institutions communication network; Internet access in public schools; People with special needs	Local public administration management information systems; Justice court Intranet; GIS	City guide; Entertainment, Arts & culture initiatives; Local government Web site	e-business, Agriculture; Job opportunities; Environment; Teleworking	Community building based on city metaphores
Bragança	Municipality communication network; Internet access in public schools	Municipality management information systems; GIS	City guide; Local government Web site	e-business; Telemedicine; Agriculture	
Guarda	Internet access in public schools		Local government Web site	e-business; Telemedicine; Teleworking	
Marinha Grande	Advanced telecommunication demonstration centre; Internet access in public schools	Local industries Knowledge network (Glass, moulding and plastics)			Mobilization of firms and public institutions for the use of ICT
Castelo Branco	Municipality communication network; Internet access in public schools		City guide; Local government Web site; Art & culture		
Trás-os-montes Digital	Internet access in public schools	Content management platform	Regional Portal	Telemedicine; Agricultural Network; Job opportunities	
Alentejo Digital	Intranet for 47 municipalities	Content management platform	Regional Portal	Job opportunities	

(a) *Networking and connectivity includes communication networks and Internet access.*
(b) *Information Systems includes technological components that store and process data like data bases, electronic mail, ERPs, management information systems, content management, application serves and business intelligence software.*
(c) *Online presence or downloadable forms.*
(d) *Electronic form submission or interaction through the Web.*
(e) *Mobilization and context building initiatives.*

THE IMPORTANT ROLE OF COMMUNITIES OF PRACTICE IN DIGITAL CITIES: FOSTERING LEARNING NETWORKS

The evidence of the projects discussed earlier show that we must extend our analysis from a technocratic paradigm of technical change and look at broader system design fostering societal developments. In particular, the experience of projects such as those developed in the cities of *Marinha Grande* and *Aveiro* clearly shows the important mutual relationships that specific project-based communities have on the facilitation of network societies, but also the fact that the implementation of digital cities may significantly improve the efficiency of those communities. In the following paragraphs, we extend this evidence and argue that the success of digital cities rely on the specific development of communities of practice, namely those integrating knowledge networks.

We refer to project-based communities, oriented to specific social and economic goals, that will benefit, and

B

gain from, digital networks if particularly challenges by knowledge-based activities. In the case of *Marinha Grande* the evidence is that economically-oriented networks based on mould-forming companies has particularly launched business networks, which still require long-term processes and continuous funding, as well as adequate institutional setting. In this case, it should be noted the role of the related industrial association and technology centre in promoting the necessary links and networking facilities, which again support our previous analysis of the need to consider basic framework conditions.

In a different scale, but also using relatively reduced level of incentives, namely at an international scale, the evidence provided by the *RuralNet Project* developed in the city of *Bragança* also shows the critical importance of project-based mechanism to support and sustain digital cities. But of specific interest in our context, are some of the activities developed in *Aveiro*, in that knowledge-based activities could promote and sustain digital networks well beyond the period under which public incentives were made available.

The reason why knowledge-based activities are particularly prone to foster and sustain digital networks is because they will increasingly rely on "distributed knowledge bases", as a systematically coherent set of knowledge, maintained across an economically and/or socially integrated set of agents and institutions, as discussed by Smith (2000) and Conceição, Heitor, and Veloso (2003), among others. The relevance of considering distributed knowledge bases across economically and/or socially integrated set of agents and institutions leads us to the concept of social capital. In the broadest sense, social capital is associated with the "social capabilities" (Lamoreaux, Raff, & Temin, 1999) that allow a country or region to move forward in the process of development. In a more sophisticated treatment, Coleman (1988) states that social capital is "a variety of different entities, with two elements in common: they all consist of some aspect of social infrastructure, and they facilitate certain actions of actors—whether personal or corporate actors—within the structure." The relationship of social capital for the economic performance of nations was recognized by Olson (1982) and North (1990), in broad descriptions of the process of development.

Referring again to the evidence provided by some of the projects discussed earlier, namely those at Aveiro, the role of higher education institutions appear to be particularly important in fostering network activities, namely in the form of knowledge-based communities. Following the analysis of Castells and Hall (1994), "it takes a very special kind of university, and a very specific set of linkages to industrial and commercial development, for a university to be able to play a role it often claims to play in the

information-based economy". Definitely, those technical universities that are pure teaching factories, or work under a bureaucratic structure, are unlikely to act as generators of advanced technological milieu. Again, this recalls our attention to the role of institutions in planning digital cities and promoting their impact.

Still in this context, Mitchell (2004) argues that the most obvious advantage of digital networking is that it provides an efficient way of "aggregating specialized expertise" through "common access to project databases, compatible software tools, and advanced telecommunication capabilities." But, he emphasizes that "it does little about the problems of creating trust and confidence, and of building intellectual and social capital for the long term", requiring the development and maintenance over weeks and months of "project-based learning communities" looking at a common and complex target. Long term collaborations can provide a more permanent framework of online resource-sharing, and examples of such an initiative shows the need to bring scale and diversity, beyond time. Based on this example, Mitchell concludes that we should look beyond the popular idea of learning communities and seek to produce communities that "motivate and sustain creative discourse yielding original intellectual products such as architectural and engineering designs", the so-called "creative communities".

DISCUSSION: THE SOCIAL AND CULTURAL SHAPING OF ICT

Our discussion is framed within three main levels of analysis, namely infrastructures, contents and context, which are comparable with those schemes that consider five mains aspects, namely: infrastructure, access, applications and services, digital content development, and ICT skills development (Tsipouri, 2002). In fact, the evidence provided by Lena Tsipouri throughout Europe leaves us to jointly consider the first two levels under infrastructure, as well as to join application and services and digital content developments into a single level of analysis. In addition, we broaden the scope of the so-called ICT skills development to include other contextual issues and local characteristics of communities of practice.

In previous articles, we have focused our analysis on the type of incentives and institutions required to allow the mobilization of ICT (Heitor & Moutinho, 2004a, 2004b). In this article, we focus the analysis on the cultural and social shaping of these technologies and argue for the need to consider human-centred infrastructures and systems. This is because although incentives and infrastructure greatly inform our understanding of economic development, they do not tell the whole story about the

differences across the various projects discussed previously. This is because both incentives and infrastructure do not operate in a vacuum, being shaped by and shaping the particular context where they operate. In the scope of our analysis, the city or region must have embedded a set of social capabilities that define the context under which digital cities evolve. Consideration of contextual issues in building-up network societies have not always been considered in many different situations throughout the world, as acknowledged by Castells (2001), among others, and evidence shows that specific measures to promote adequate contexts and mobilize people in the projects considered in this article have also been scarce.

Following the seminal work of Mansell and Steinmueller (2000), the mobilization of the information society must overcome some critical uncertainties: (a) unclear expectations related to the level of dematerialization of social and economic activities; (b) effective adoption patterns of new technologies by citizens and customers, particularly influenced by accessibility, affordability and usability; and (c) unpredictability of demand for interactive services from both localized and geographically dispersed communities. Our evidence supports the critical need for adequately managing those uncertainties and shows the necessity of effective infrastructures, incentives and adequate institutional frameworks to be promoted over time and across space.

But the implementation of complex technology-enabled infrastructures typical of digital cities calls for a broader approach where social and cultural aspects are integrated in early design phases to mitigate uncertainties, such as sustainability, flexibility and scalability. Moreover, we can expect that digital cities to have other unexpected properties, or emergent properties, "developed by users of a system" and "often unbeknown to the system designer" (Moses, 2003). Being so, the stakeholders involved in the co-evolution of urban areas and ICT would be better off if, as proposed by Cooley, "the current mechanistic paradigm of technological and societal development [would be substituted by] human-centered systems [that would] provide a powerful alternative philosophy for system design and a broader educational and societal development". He adds that "[this philosophy] regards the social and cultural shaping of technology as central to the design and development of future technological systems and society as a whole", in terms of "knowledge-based adaptive human-centred environments" (Cooley, 2000).

Expanding this conceptual framework to the entire city or even whole regions in order to consider the way millions of people interact with information and communication technologies in their daily life, it is clear that the initial approach to design digital cities described in the last section need to be reconsidered. Table 2 describes main implications and requirements of emerging trends, so that the vast majority of potential late adopters are inclusively considered in future digital city projects. As Dertouzos (2001) argues, we can avoid "drowning in information overload and computer complexity only by throwing out last century's model for computing and adopting—indeed, demanding—a new computing philosophy, a new master plan, that lets people interact naturally, easily, and purposefully with each other and

Table 2. Emerging trends in the mobilization of the information society, towards a new generation of "digital cities"

Layer of Analysis	From	To	Implications and requirements
Infrastructure/access	Conspicuous objects	Invisible infrastructure	Embedding ICT infrastructures in urban daily life, fostering **human-centered systems**
	Fixed access	Roaming	Competitive **mobile services** and improved regulatory framework for **increased individual participation**
Content/services	One-way distribution of information	Online collaboration and participation	Specific knowledge of institutional and local contexts in order to help developing **interactive contents**
	Web functionalities	Networked activities	New competences in content and services development, **enhancing user activities and networks**
Human and social context	Technology supply	Mobilization of users	Mobilizing "**change agents**" to foster communities of practice (CoPs) and **user involvement**
	Standards	Interoperability	Building **individual and social competences** through knowledge-based adaptive human centered environments

the surrounding physical world". And he adds, "to put it in action requires three big steps: changing the mind-set of users and designers; ensuring that our machines are easier to use and make us more productive; and insisting that new technology reach many more people".

Norman (1998) noticed that, in fact, technological systems tend to increase internal complexities exponentially to meet the continuous evolution of users needs, but its interfaces are likely to be constantly simplified to perform specific activities to a broader base of users. The opportunities and possibilities of the co-evolution of urban development and ICT are so vast that this strategy, "edge to core", would be more appropriated to implement the next generation of digital cities. It starts by finding out the critical interfaces between city dwellers and its supporting ICT infrastructure and only then developing objective technology-enabled services to meet existing or potential demand.

On the other hand, the number of potentially connected nodes within urban environments has significantly increased in the last couple of years (see Figure 4), and includes GSM/GPRS wired PDAs, Wi-Fi enabled laptops, 3G mobile phones, ADSL connected game consoles and entertainment PCs, Bluetooth tablet PCs, Videophones, Interactive TVs, real-time environment sensors (e.g., air and water quality), large databases (corporations, libraries, museums, public administration), GPS oriented cars, and GPS traceable trucks and buses. New layers of territory-related data and information are be-

ing created on a daily basis, like municipal geographic information, Internet city guides, interactive maps and routes, and 3D worlds. To cope with this increased complexity, a new technology must add another layer of distributed computing and data management to the current Web-based information distribution paradigm. In fact, as computers and networks become ubiquitous and interlinked, they will turn out to be another invisible urban infrastructure, like electric grids and sewage systems that will sustain daily life.

Grid computing, as described by Berman, Fox, and Hey (2003), can be the "computing and data management and infrastructure that will provide the electronic underpinning for a global society in business, government, research, science and entertainment. Grids, integrate networking, communication, computation and information to provide a virtual platform for computational and data management in the same way the Internet integrates resources to form a virtual platform for information. [They] are intrinsically distributed, heterogeneous and dynamic." Grid computing was shaped by the same early driver that has pushed the scientific communities of practice to build the Internet and the World Wide Web: the construction of a virtual collaborative environment for scientific research. The main objective still is, as it was before, to share networked resources for creation, accumulation and diffusion of knowledge.

The current grid model has a 4-layered architecture that includes (Figure 5):

Figure 4. Grid resources linked together in a "digital city" infrastructure
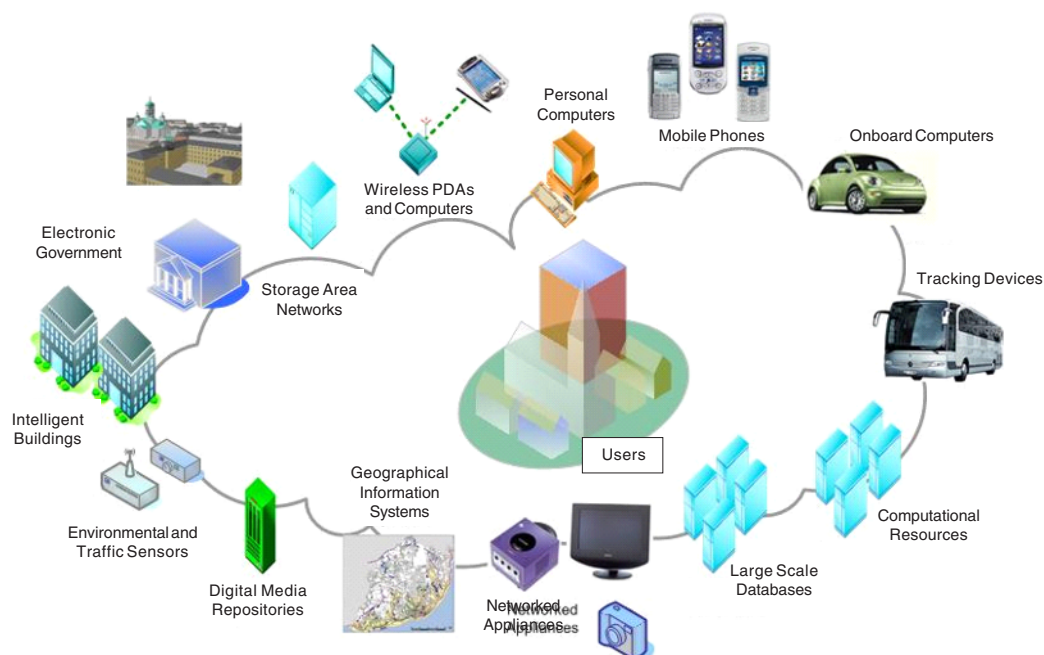
1. hardware resources, such as computers, networks, data storage, sensors and other devices that weave the underlying fabric;
2. interoperable protocols, services and applications that virtualize and secure the access to the grid;
3. common grid middleware, tools and services, such as resource allocation and monitoring;
4. grid applications.

The vertical layers represent new devices, and institutional arrangements to create common policies, grid economy and a open global-area networking (Foster, 2003). We argue that on top of the current model, an activity-based, human-centred layer of services should be added to help the mobilization process (as a complementary vertical layer). This territory-related additional layer could be enabled by specific knowledge-driven ontology (Fensel, van Harmelen, & Horrocks, 2003), natural language (Lenci, Calzolari, & Zampolli, 2002) and/or the semantic Web capabilities for "handling and support for knowledge processing" (De Roure, Jennings, & Shadbolt, 2003).

If one considers the broad social and economic context under which digital cities may be facilitated, we must consider the conditions for integrated learning processes. This has led Conceição, Heitor and Lundvall (2003) to build on Lundvall and Johnson's learning economy (1994) and to discuss the learning society in terms of innovation and competence building with social cohesion. They view innovation as the key process that characterizes a knowledge economy understood from a dynamic perspective, while competence is the foundation from which innova-

tion emerges, and which allows many innovations to be enjoyed. In other words, it contributes both to the "generation" of innovations (on the supply side of the knowledge economy) and to the "utilization" of innovations (on the consumptions side of the knowledge economy). Conceptually, the foundations for the relationship between learning and economic growth have been addressed in the recent literature (Bruton, 1998), with learning being reflected in improved skills in people and in the generation, diffusion, and usage of new ideas (Conceição & Heitor, 2002).

Learning can occur in many shapes and forms, some of which are informal, some formal. As described before, the institutional framework that comprise the national and regional systems of innovation formalize the technological infrastructure critical to generate the learning processes for individuals, firms, and nations, that ultimately lead to long-term development. Thus, looking at a particular set of organizations, their capabilities and related institutions, provides important lessons for development.

The analysis previously noted is broad in scope and considers network societies as wide social and economic processes, which we argue occur across time and space and require the dynamic adaptation of infrastructures, incentives and institutions, in a way that calls our attention for the need to foster learning societies. However, the evidence of the projects discussed in this article show that we must extend our analysis to other aspects of the learning society. This is because the experience of projects such as those developed in the cities of *Marinha Grande* and *Aveiro* clearly shows the important mutual relation-

Figure 5. Layered architecture of a semantic grid enabled digital city (Modified from Berman, Fox, & Hey, 2003)
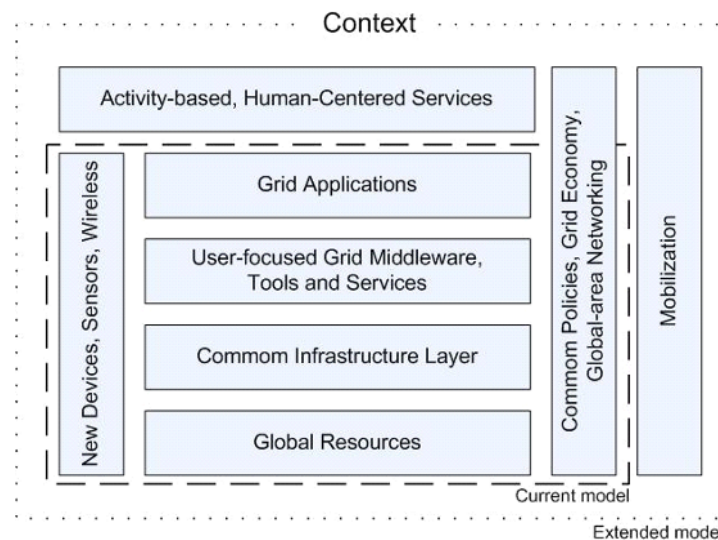
ships that specific project-based communities have on the facilitation of network societies, but also the fact that the implementation of digital cities may significantly improve the efficiency of those communities.

Within this perspective, our analysis calls for policies that consider long term approaches of dynamic environments, which require to be continuously monitored and evaluated. Specific incentives for infrastructures should continue, but articulated with the need to foster knowledge-based adaptive human-centred environments as drivers of larger communities of users. This requires a continuous public effort, but also a better understanding of the effectiveness of the mix of public support mechanisms and private incentives for the development of digital cities.

CONCLUSION

The co-evolution of urban environments and ICT is analyzed in terms of the social and cultural shaping of information technologies and related uncertainties for their application to regional and urban contexts. The analysis is based on observations in different Portuguese metropolitan areas and regions with the ultimate goal of increasing regional competitiveness, by promoting public awareness and participation in decision-making processes. It is argued that the territory is a basic infrastructure that justifies and invites for the construction of several layers of information, but above all for communication infrastructures and digital contents well arranged with local contexts. It is suggested that knowledge driven communities as particular forms of communities of practice are important drivers of larger communities of users.

Our analysis led us to suggest that while the role of communities of practice needs to be re-examined, the cultural and social shaping of information technologies requires the specific development of human-centred systems. We refer to "edge to core" strategies for the next generation of digital cities.

Our reflections were based on the need to consider uncertainty in the mobilization of ICT, which requires individuals, firms and organizations to operate in dynamic environments, where markets and technology are changing fast and in unpredictable ways. This calls for the need to combine flexible infrastructures and adequate incentives with institutions, to foster the necessary context for *digital cities* to succeed. The new paradigm of semantic grids can help ICT complexity to be alleviated and become an invisible infrastructure embedded in urban daily life.

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KEY TERMS

B

Digital City: This concept encompasses a diversified number of approaches to the co-evolution spatial development and the diffusion ICT. Schuler (2002) has identified five basic design patterns: (a) digital city as a highly-wired territory; (b) community network; (c) 3D or 2D representation of physical cities; (d) local government portal; and (e) commercial city guides. While the first example concentrates on digital infrastructure, the other four are manifestations of different aspects of urban everyday life on the Internet. Recombinations as well as whole new patterns that emulate the huge diversity of real cities are also emerging. In the context of this article, the digital cities are presented in terms of a technology-enabled and knowledge-based view of the territory to strengthen social networks, promote metropolitan systems of innovation and foster competence building.

Semantic Grids: Merger of two concepts: Computer Grids and Semantic Web. Computer Grids integrate networking and communication infrastructures, heterogeneous computational resources and distributed data to provide a virtual platform for global computing, visualization interfaces and data management without regard to geographic location (Berman, Fox, & Hey, 2003). Semantic Web "is an extension of the current Web in which information is given well-defined meaning, better enabling computers and people to work in cooperation" (Berners-Lee, Hendler, & Lassila, 2001). Semantic Grids are computer grids that extend its capabilities to enable "information handling and knowledge processing" as a "service-oriented architecture in which entities provides services to one another under various forms of contracts". Thus, semantic grids' "environment is composed of data/computation services, information services and knowledge services" (De Roure, Jennings, & Shadbolt, 2003).

Territory-Related Ontology: Descriptive specification of terms and their respective relations, within the context of a physical or virtual space. It is an abstract, although explicit, conceptualization used to describe, comment and exchange knowledge and meaningful content among computational resources and users of a geographical domain.

Cambodian Youth Making Connections

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INTRODUCTION

This article explores how urban Cambodian youth are creating connections and exploring the opportunities that new technology offers for their social and community development within the Khmer diaspora. It contends that these young Cambodians are using ICT to define and express themselves as both individuals and members of a distinct new cohort. This study was conducted from July-September 2002 in Phnom Penh, Cambodia as part of the Master of Arts in Communications at RMIT University. A comparison of qualitative and quantitative data allowed this study to develop a rounded profile of young Cambodians' (aged 18-24) ICT usage habits. ICT are defined as mobile phones, SMS, the Internet, the World Wide Web and Chat. This article contends that this uptake of ICT highlights the emergence of an urban elite, a digital elite whose use of ICT is helping to define the new generation and secondly facilitate connections that build community within the Khmer diaspora.

THEORETICAL AND SOCIAL CONTEXT

The Khmer Diaspora

After the fall of the Khmer Rouge regime in 1979 families tried to reunite and the bond of family was extended to include distant relatives such as aunts and cousins. The spread of nuclear family members across the globe after the refugee exodus in the 1970s (Robinson, 1998) has meant that this basic family unit has been challenged. The diasporic experience of Cambodian refugees and the difficulties they face integrating into a third culture have been explored mostly from a social welfare perspective, in particular in Mudaly's (1999) research into young Cambodians in Melbourne, Australia. The work of Smith-Hefner (1999) explores the Khmer American experience of moral education and the role of religion in the diasporic community. There are some studies on Vietnamese culture within the diaspora in the US and Australia which also provide a point of comparison for the Cambodian situation (Cunningham & Sinclair, 1999).

One emerging function of ICT is the role it plays with diasporic people. As stated by Mitra (1997) in his study of India on the Internet, these people "recreate a sense of virtual community through a rediscovery of their commonality." This is of particular relevance for the young Cambodians surveyed who are using ICT to connect with their family and friends abroad.

The research presented in this article focuses on how and why young urban Cambodians use ICT. Research identified key attributes of 18-24 year old Cambodians: they are English speaking, technically literate, modern, motivated, highly educated, family minded, have a small close group of friends, increasingly globally conscious, hungry for knowledge and sociable. This burgeoning individuality and emerging self-awareness is a departure from the traditional characteristics of Cambodian society. It is in fact these new characteristics combined with the self-referential term the "new generation" that defines these young urban Cambodians.

ICT for Development

As a Least Developed Country, Cambodia is a prime example of the potential of ICT for development. A number of international organizations, multilateral agencies and Non-Government Organization such as the UN, World Bank, International Telecommunications Union and USAID have conducted research into the issues facing developing countries in the adoption of ICT. The conference *Public Awareness about Information Technology* (Phnom Penh, Cambodia, September 2001) and the Opening Address by Prime Minister Hun Sen highlighted the importance of ICT to the development of Cambodia (Hun, 2001). Since this study was conducted, the Royal Government of Cambodia with the support of UNDP and APDIP in 2003-2004 has been developing a National ICT Policy which will address five key areas: human capacity, infrastructure, enterprise, policy and regulation, and content and application.

Digital Divide

Much of the literature available about ICT in a development context focuses on the digital divide. Key works identified include coverage of the following areas: the

global skills gap (Pastore, 2001), civic engagement and information poverty (Norris, 2000), and globalization and social development (Castells, 1998). This study attempts to gain some insight into a particular group of young urbanites within a developing country on, perhaps one could say, the right side of the digital divide.

The digital divide is often identified by lack of accessibility to the Internet either physically or financially. There are an estimated 130 Internet cafés in the capital Phnom Penh though most provincial capitals have limited if any Internet cafes. Siem Reap is an exception with an estimated 20 cafés. However, these mostly service tourists and not the local population. The split between urban and rural, educated and uneducated, affluent and poor illustrates how in a country that has 85% of the population living in rural areas, the gap between information rich and poor is only widening. This is partly being addressed by the Community Information Centers in provincial capitals. These CICs are an initiative of The Asia Foundation which established them in 2002 in partnership with local NGOs to promote democracy as part of the national elections. They also focus on development activities by providing free information resources for provincial communities. These centers have become an important location for rural Cambodian youth to meet and connect.

The Impact of Location

The high cost of owning a computer or having Internet access at home means that most Cambodians who wish to use ICT do so at their local Internet café. Most educational institutions in Cambodia have limited ICT facilities for students so they rely on private enterprise to meet the need. Access in Phnom Penh has become more affordable with rates dropping from U.S. $5 an hour in 1999 to U.S. $1 in 2002 and less than U.S. $.50cents in 2004. Even with limited income, access is readily available with Internet cafés in Phnom Penh.

Location of use is a key factor in shaping usage habits. Most research in computer-mediated communication and virtual communities as discussed by Jones (1998), Mitra (1997) and Kim (2000) has presumed it is a solo act in the privacy of the home and is more focused on chat and online group activities. In Cambodia, high costs relative to income means that the most common access points are in public Internet cafés. Of the young Cambodian's surveyed, more than two-thirds most often use the Internet in a public café. The second most frequent access point was at university. Both locations are communal spaces, which are not conducive to privacy. As such, this has to be considered when evaluating what this age group seeks on the Internet.

Another issue associated with the impact of location relates to the location of friends and family that young Cambodians communicate with abroad. A comparison of the locations of friends versus family may reflect the patterns of migration. Of the countries where young Cambodians' families live, there is a dominance of western countries such as the USA, Australia and Canada. This reflects the refugee migration and family resettlement as a result of the civil war during the 1970s and 1980s. The predominance of friends in Asian locations could represent the recent increase in temporary migration for study or work within the region. This leads to the next area of discussion of how ICT are connecting Cambodians within the Khmer diaspora.

DEFINING THE NEW GENERATION

In Cambodia the new generation has a different worldview compared to their parents due to the evolution of the political landscape from tyranny to democracy. Thirty years of civil war and most significantly the Khmer Rouge regime has had a massive toll on Cambodia. Cambodian society has suffered in terms of lives and physical infrastructure, but of particular relevance here is the resultant lack of human resource development. They are the children of the killing fields, yet they only know it second hand from their parent's stories.

As children born in a post-conflict development context, stability allows young Cambodians today to have more freedom of expression and opportunities for education and employment than previous generations. This is evident in the capitol Phnom Penh more than in the provinces, where traditional life continues with an agrarian culture and the majority of the population living on subsistence levels. How this new generation manifests itself in Cambodia and identifies within the Khmer diaspora is creating a new definition of community.

In particular, how and why young Cambodians use ICT was the core tenet to this study. Not only are ICT a new means of peer communication, their adoption indicates a more profound shift in interpersonal relations. Although this move towards individualized communication is a departure from traditional cultural practice what is of interest is how this combines with the global factor of the Khmer diaspora to create a truly unique connectivity within the community.

Interestingly, the take up of this new technology in Cambodia is in accordance with similar adoption rates of urban centers in other developing countries within Asia. Thailand and Malaysia both have an active and expanding youth market. Another similarity of these Asian markets is the growing digital divide between urban and rural (Rao, 2001).

Table 1. An exercise: Defining a young Cambodian

Participants in a focus group were asked to consider the similarities and differences between three young Cambodians living respectively in Phnom Penh, Kompong Speu and Long Beach, California. Identified differences by the subjects focused on opportunity, in that those residing in the urban settings of Phnom Penh and Long Beach have more options for education, employment and entertainment.

The exercise outlined in Table 1 illustrates how this generation of urbanites perceives themselves as different to their peers in rural Cambodia. They express a greater affinity with their compatriots abroad than with their fellow citizens in the provinces, which is a common attribute amongst diasporic people. Thus further supporting this study's claim that identification as a member of the new generation is signified by their access to, use and knowledge of ICT.

As the new generation identifies itself within the region they are endeavoring to create an urban Cambodian youth identity. Young Phnom Penh Cambodians are making connections not only amongst themselves but they are looking outward to their compatriots abroad. Friendships between Cambodians across borders present an opportunity to see how this new generation is using ICT to define themselves. First, they represent how this group is identifying themselves within the Khmer diaspora and with the expatriate communities in the US and Australia in particular. Second, Khmer cultural practices are limited and are often lost amongst the popular culture of the region, making the desire to connect with people and activities of their own culture important in their identification as young urban Cambodians.

In summary, the profile of the new generation of young Cambodians consists of a developing self-awareness and identification as modern Cambodians. They display the characteristics of early adopters, which is in accordance with usage patterns globally for this age group. They are aware of the new skills and literacies required to succeed in the information age and are committed to achieving their personal career and educational goals. They identify English as the language to learn as it opens many possibilities for work as well as social activities both within Cambodia and abroad. The young Cambodians involved in this research study are clearly aware of the potential that ICT presents them. What is interesting to note is that they are using them on their own terms and not allowing international or foreign influences to manipulate their own identity as Cambodian.

MAKING CONNECTIONS

Young Cambodians are using their mobile phones and the Internet to communicate with each other or to make new friends abroad. The immediacy of ICT means that a young man can e-mail or call a DJ at the local radio station and request a favorite song or a young woman can chat on MSN to friends studying in Singapore. This space is a very different landscape than their parents occupied. Young Cambodians are using new technology to socialize and have fun as well as develop new skills.

The rise of importance of the social group outside of the family is clearly represented in the usage habits of both SMS and e-mail by young Cambodians. Both these communication methods are predominantly used for contact amongst friends, whether it is within Cambodia or abroad. Of those making contact within Cambodia, almost all are communicating with friends in Phnom Penh. This result is mirrored in the data for SMS and suggests that the use of ICT in Cambodia is an urban phenomenon. Of course, what is of interest, yet outside of the bounds of the current study, is how different this is compared to what is happening in the rest of the world.

A key finding of this research is that young Cambodians' preference for peer communication via ICT replicates the usual hierarchical communication structures of traditional Cambodian society. This is also supported by the limited family interaction via ICT, further demonstrating that young Cambodian's ICT usage is predominantly a peer, friendship-based activity. Friendship via ICT is not a new phenomenon for youth in the north. However young Cambodians have not had the luxury of talking on the phone for hours, like American teenagers. Traditionally they have only met at school, in their neighborhood, at the pagoda during festivals, and most often are supervised by family. Social life is becoming more liberal and it is hard to determine if this new freedom of movement is related to the ability to coordinate social activities.

Results indicated that the majority of young Cambodians are connecting by e-mail with fellow Cambodians.[1] When respondents were asked how they met their friends who they talk with on the Internet, approximately half indicated that they knew through working or studying together. Thus further illustrating how friendships within the normal social structure are transferring seamlessly to the new modes of communication amongst young Cambodians.

Young Cambodians use ICT to communicate with family members both locally and internationally. Mobile phones outnumber fixed lines and most urban

families have access to mobile phones either individually or via the mobile phone booth, which is common on street corners in Phnom Penh. The provision of VoIP sees many families using ICT to talk with their relatives overseas.[2] Participant observation shows that VoIP is a group activity with whole families from grandmothers to children crowding into a cubicle to talk with loved ones overseas. However, this does not appear to be a popular activity of young Cambodians.

Customary family communication patterns can be sustained when using Khmer. However, if communication requires English, the younger members of the family may be more involved as translators or mediators as parents have limited English. This may account for the results regarding e-mail contact of young Cambodians, who indicated that they communicate with family abroad mostly via e-mail.[3] Given the current limitations of Khmer language online, e-mail communication by necessity must be English based.

FUTURE TRENDS

This study asserts that young Cambodians are aware of the potential that ICT offers them for connection within the Khmer diaspora and the global Cambodian community. When asked about their perception of the Internet, the highest agreement rate was with the statement "the Internet is helping Khmers meet up across the world." This combined with the reasons why young Cambodians use the Internet such as "to meet Cambodians abroad" and "to meet/reunite with family abroad" further supports the claim that ICT are helping to connect families across the Khmer diaspora, thus enhancing and building the Cambodian community across the world.

If ICT are truly going to assist Cambodia there are a few vital areas that require development. The localizing of content is paramount and the Unicode Khmer font project and the Khmerization of Microsoft Office and Windows are two key initiatives that will have far reaching impact on the uptake of ICT. Given the results for SMS and e-mail use, the potential market for Khmer-based ICT is untapped. Perhaps future research could be a follow up study on the impact of these developments once they are implemented.

It can be concluded that ICT are facilitating the creation of a new cohort, increasing their connectivity and extending their communication both within and outside Cambodia. Yet what are the implications of these findings for Cambodia and this new generation? ICT may provide direction for improvement of services or contact with this segment of the population. Such applications could inform NGOs how to better educate young people of the risks of HIV/AIDS or to increase audience participation with local TV and radio stations. Whether it is commercial, social or personal, the implications of ICT within the new generation of young Cambodians are ripe for development.

CONCLUSION

Even though Cambodia is a Least Developed Country by OECD standards, a budding youth culture is present regardless of the challenges post-war Cambodia faces. For those born after 1979, their understanding of Cambodia's "killing fields" is only from their parent's stories. As young Cambodians choose to engage in new communication channels such as SMS, e-mail and chat, it represents their engagement within the global Khmer community.

Young Cambodians are using ICT to define and express themselves as both individuals and as members of the "new generation." Contextually the paradox of Cambodian society, the dichotomies of traditional versus modern, urban versus rural and individual versus collective frames the emergence of the new generation as reflected in the usage patterns of ICT. What is emerging as the strength of this new generation is their choice to use ICT outside the traditional bounds of family for their own personal development and connection with fellow young Cambodians, whether they're in Phnom Penh or abroad.

Cambodians involved in this study are clearly aware of the potential that ICT presents them. What is remarkable is that they are using them on their own terms and not allowing international influences to challenge their identity as Cambodians.

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KEY TERMS

APDIP: Asia Pacific Development Information Program is the regional ICT program of UNDP [www.apdip.net].

Cambodia: A country of Southeast Asia on the Gulf of Thailand. Once part of the Khmer empire that ruled the entire Mekong River valley, the area was controlled after the 15th century by the neighboring kingdoms of Siam and Annam (Thailand and Vietnam). Cambodia became part of French Indochina in the 19th century and proclaimed its independence as a kingdom in 1953. After the overthrow of the monarchy in 1970, Cambodia commenced a long period of political and social disruption, especially under the Khmer Rouge regime led by Pol Pot, which was responsible for more than a million deaths from 1975 to 1979. The monarchy was restored with the Paris Peace Accord in 1992 and democratic elections have been held in 1993, 1998 and 2003. Phnom Penh is the capital and the largest city. Total Cambodian population (2003 est.): 13,124,764.

Cambodian: A person who lives in Cambodia and may be from a variety of ethnicities: Cambodian 90%; Chinese and Vietnamese 5% each; small numbers of hill tribes, Cham Muslims, and Laotians.

Codec: Short for compressor/decompressor.

Diaspora: A dispersion of a people from their original homeland such as the Jewish diaspora after WWII, Vietnamese diaspora in the early 1970s. The Khmer diaspora was the result of the civil war and displacement of people due to the Khmer Rouge regime in the 1970s. Cambodian refugees mostly settled in the US, Canada, Australia, France and Thailand.

Digital Divide: The gap that exists between those who have and those who do not have access to technology (telephones, computers, Internet access) and related services.

ICT: Information Communications Technology. ICT are defined as mobile phones, SMS, the Internet, the World Wide Web and Chat.

Khmer: The Khmer people, the ethnic group to which the great majority of Cambodians belong to.

Khmer Language: Khmer (Cambodian), a member of the Mon-Khmer group of Austro-Asiatic languages. Khmer has had considerable influence from Sanskrit, and Pali. Some of these influences, such as Sanskrit and Pali, come from the influence of Buddhism and Hinduism on Khmer culture; the latter two are the result of

linguistic contact and geographic proximity. The oldest dated inscription in Khmer dates from 611 AD. Written Cambodian is alphabetic like English (and unlike Chinese). Its alphabet consists of two separate categories-consonants and vowels. The Khmer alphabet closely resembles the Thai and Lao alphabets, which were developed from it [http://www.omniglot.com/writing/khmer.htm].

Kompong Speu: This is a province of Cambodia. Its capital is Kompong Speu.

OECD: Organization for Economic Cooperation and Development an international organization helping governments tackle the economic, social and governance challenges of a globalized economy

Phnom Penh: The capital and largest city of Cambodia, in the southwest part of the country on the Mekong River. Founded in the 14th century, it became the capital of the Khmer after c. 1432 and the capital of Cambodia in 1867. Population: approximately 1 million.

SMS: Short Message System or Text Messaging.

UNDP: United Nations Development Programme.

Unicode: A 16-bit character set standard, designed and maintained by the non-profit consortium Unicode Inc. that aims to standardise all non-roman languages. The hexadecimal range U+1780 to U+17FF in Unicode/ISO10646 includes characters of the Khmer/Cambodian script. With Unicode Version 4.0 an additional range has been added: U+19E0 to U+19FF. The Khmer script, in turn,

is used to record text in the following languages: Khmer, Sanskrit (transliteration), Pali (transliteration), Cham, Krung, and other minority languages used in Cambodia. Khmer Unicode is the only globally standardized encoding of the Khmer script.

VOIP: Voice over Internet Protocol. Any technology providing voice telephony services over IP, including CODECs, streaming protocols and session control. The major advantage of VoIP is lower cost, by avoiding dedicated voice circuits. Voice over Internet Protocol uses the computer terminal as the phone with a handset attachment.

ENDNOTES

[1] The survey did not differentiate if they were Cambodians who recently moved overseas or those who could be considered expatriate Khmers abroad.

[2] Although currently illegal, the high cost of official international calls at a rate of US$1.00-$2.62 per minute makes the alternative of VoIP at 300-600riel (US$.7-.15) per minute worth the risk.

[3] Usage of other ICT such as SMS indicates that there is limited contact outside Phnom Penh with half never having used SMS to make contact with family in the provinces. Results also indicates that SMS is not a popular means of communicating with family abroad further supporting the finding that SMS is an urban phenomena.

Capturing Community Memory with Images

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INTRODUCTION

Around the world, communities are examining the issues of preserving cultural identity, documenting local history, promoting tourism and examining their shared heritage. Many communities have relied on official records, tradition, customs, stories (both oral and written), language, myth and similar means for the preservation of cultural identity and community memory. The Magee Community Collection (Leath, 2004) began in 1999 as an exploration of how Information and Communication Technology (ICT) might be used as a means of augmenting community memory through the provision of interactive and widely distributed ways of gathering, indexing and archiving multimedia assets. It was hoped that with time and effort cohesive processes and associated tools for these tasks would emerge (Leath, 2000). No established standards for processes and associated tools existed at the time of initial development, and it is anticipated that diversity in approaches, development and structure of community memory multimedia archives will exist for some time to come.

BUILDING COMMUNITY MEMORY AND ONLINE (VIRTUAL) COMMUNITIES

There is ongoing interest in the building of community memory. The term "building" rather than "creation" is more appropriate in that the process is most effective as a continuous, iterative process (Preece, 2000). In communities, as in individuals, the fundamental difference between knowledge and memory is persistence. An individual may at any given moment have awareness, knowledge and sentience, but only a portion of this momentary awareness is given persistence through commitment to memory. When an individual dies, their individual knowledge and memory perishes, with the exception of those memories that have been either implicitly or explicitly committed to means that ensure their persistence. A similar dynamic works within communities. Communities are made up of individuals, each of whom possesses unique memories. Within themselves, communities possess many of the means through which individual memory may persist and be shared. Historical means of preservation include but are not limited to:

- Tradition
- Custom
- Language
- Writing
- Stories
- Myth

These historical means of building and preserving community memory may now be supplemented by technical means previously unavailable.

Geographic communities have differing motivations for developing community memory, these motivations may include (amongst others):

1. **The use of global communications to enhance local communication:** As well as connecting people in diverse places around the world, the wide availability of telecommunication and information technologies has also encouraged geographically local communication.
2. **The fear of cultural imperialism:** Is there to be only one village with uniformity of language, culture and custom? Concern over cultural dominance by the more technically advanced has resulted in a promotion of efforts toward the preservation of cultural heritage.
3. **The economic importance of tourism:** Improvements in transportation and greater disposable incomes for much of the more developed world have increased tourism and its resultant economic importance, particularly to less developed regions.

In light of the factors mentioned above, ICT can provide a means of augmenting community memory through the provision of interactive and widely distributed means of gathering, indexing and archiving digital multimedia assets, assisting in:

- The preservation of unique cultural identity and its propagation;
- The documentation of local history;
- Making available information of interest to prospective tourists and others;

- Fostering a spirit of community and shared heritage;
- Enabling cohesion with community "Diaspora."

Each community will have a different starting point in building community memory through ICT. Some communities will have no first-generation assets (photographs, audio recordings, maps, etchings, drawings, paintings, books, etc.) and will have to begin by acquiring these assets. Other communities will have existing collections that will require equipment, software and procedures for digitisation. Still other communities will require tools and procedures for organising the multimedia assets they currently hold into a cohesive whole. To make the most of their multimedia assets, all communities will require interactive tools to promote community involvement.

Cliff Figallo lists the following benefits for Web site owners in fostering online (or virtual) communities (Figallo, 1998):

- It creates steady streams of fresh, user-originated content;
- It weaves a web of personal relationships that bind their participants to the site;
- It acts as a social flywheel, maintaining the momentum of interaction by feeding back into itself, drawing its members in and stimulating them to remain active and productive over time;
- It contributes to its own support and rejuvenation, attracting, training, and socializing its new members, and forging its own new directions for growth and expansion;
- It tells you, the host, what its members want and how to make your site more attractive and useful for them;
- It spreads your marketing message through the trusted grassroots grapevine of the Net in the testimony of satisfied participants, and in the stories that come out of its group interaction.

Building community memory through the utilisation of multimedia assets may be implemented alongside other community building tools and functions in building online communities. Community building tools and functions can be implemented in capturing community memory for those reasons listed above. Amy Jo Kim (2000) puts forward the following online community building tools and functions:

- **E-mail lists:** Moderated, un-moderated and broadcast;
- **Bulletin boards:** Threaded and linear;
- **Chat rooms:** Text-based, graphic, voice and virtual worlds;
- **Taxonomy and metaphorical models:** Categorical, geographical, media (i.e., TV channels, etc.);
- **Profiles:** System profile, user personal profiles, user public profiles;
- **Differentiated membership:** Visitor, novice, regular, leader, elder.

In summary, the process of capturing community memory and implementation of other community building tools and functions could and should co-exist, and are synergistic. Capturing community memory can assist in community-building activity, and community-building activity can assist in capturing community memory.

BACKGROUND

Every archive has to start somewhere, and the Magee College campus of the University of Ulster was fortunate enough to possess an archive of photographs and funding for digitisation. The Magee Photographic Collection consisted of nearly 4,000 photographic negatives of pictures of Londonderry and the Northwest of Ireland, dating from the 1860's up to about 1970. Before digitisation, the collection was indexed according to a system consisting of a set of index cards colour coded according to subject (Buildings, Events, Personalities, Ephemera, etc.) and number coded for location. In addition to this coded information, each entry contained such details as the name of the donor and any copyright restrictions governing the use of the material.

Around November 1996 a call went forward to invite institutions to consider inclusion of their digitised images in what was to be known as the Knowledge Gallery Project. At the time, there was considerable interest from commercial organizations including large multinationals like Kodak. In the meantime, the U.K. Joint Information Systems Council approved approximately £350,000 for an initial digitisation and cataloguing programme. The Magee Photographic Collection was submitted for consideration, and was ultimately one of the collections across the U.K. accepted for inclusion in what was to be known as the JISC Image Digitisation Initiative (JIDI, the JISC Image Digitisation Initiative, 2004).

The JIDI Project established core elements, which were required to accompany each image. These elements drew heavily from the Visual Resources Association (VRA) core categories describing visual resources (Lansi, 2002). These elements are collectively referred

Table 1.

Master	Photographer	Donors
Image Number	Photographer ID	Donor ID
Image Date	Photographer Name	Donor Name
View Description	Photographer Address	Donor Address
Donor		
Photographer		
Image Type		
Image Format		
Owner Visual Collections		
Image Source		
X Dimension		
Y Dimension		
Dimension Units		
Copyright Owner		
Copyright Status		
Filename		
File Size		
Bit Depth		
Colour Space		
Compression		
Capture Device		
Creator		
Resolution		
Digitisation Date		

to as the image metadata. JIDI metadata is divided into three areas:

1. Descriptive metadata
2. Administrative metadata
3. Structural metadata

The Magee Community Collection metadata was organised into three database tables named Master, Photographer and Donors. Table 1 gives the Magee Photographic Collection metadata field names.

The UMI/ProQuest Controlled Vocabulary of Subject Terms (ProQuest Controlled Vocabulary, 2004) was used to generate consistent keywords for all of the images. The use of a controlled vocabulary maximises the effectiveness of searching. Keywords were placed within the descriptive text for each image allowing for matches on free text searches.

ELICITING COMMUNITY MEMORY

The first collection included in the Magee Community Collection has been the Magee Photographic Collection. In parallel with the photo digitisation process, the information on the colour-coded index cards accompanying the original photo collection was entered into the Mage Community Collection database tables. The data entry staff also entered any supplemental information they could from their own local knowledge at the time of data entry. With the exception of the interaction of the

data entry staff, the digitisation of the Magee Photographic Collection could be considered a simple image archive. Such an archive was useful, but did not leverage community memory.

Some index cards for the Magee Photographic Collection contained no specific descriptive information about the associated image. A method of generating descriptive information for these images had to be developed. An eliciting process was developed for images without descriptive information which involved the Foyle University of the Third Age (U3A). The Foyle U3A membership consists of men and women aged 50 years or over from all sections of the local community. Three sessions were scheduled with the Foyle U3A during which a buffet lunch was provided, and Foyle U3A members viewed projected images, which had no accompanying descriptive information. Members were invited to volunteer descriptive information, which was transcribed by two researchers. This proved to be a very effective means of eliciting information, while also entertaining and bonding members through shared memories. Upon hearing of the success of this method, the JIDI project manager attended the final of the three sessions.

After the initial digitisation, data entry and elicitation events with the U3A the Magee Community Collection was placed on the Internet where a wide variety of viewers could interact with it. The collection interface allowed for the immediate online submission of new descriptive information by collection viewers. This information is evaluated by a moderator before inclusion in the collection database. In this way, community memory is captured and expanded. Some of the earliest feedback is reproduced in Table 2 for illustration (IP addresses, and e-mail addresses have been removed for anonymity).

Additionally, online availability of the collection has prompted viewers to offer to submit further images and information. In some of these cases, photos have been sent and they have been scanned. In other cases, viewers have submitted digitised images which they have scanned themselves.

EXAMPLES OF MCC INTERACTION

The screen shot in Figure 1 shows the introductory screen for Magee Community Collection. The side panel of buttons link to the topics Home, Browse, Links and Help & Information. A button is also included below for the site map.

The screen shot in Figure 2 shows that images may be browsed either sequentially, by a free text search on fields or by a keyword search. The database fields

Table 2.

Corrections have been requested from at XXX.XXX.XXX.XXX with the following message: Ted The photo C 148 tif is of Jones and Lowthers laundry in Bishop Street, location boundries,Bishop St./Corporation St./Barrack St. Enterprise House was in the factory in Great Jame's St./Little James St. Requestors e-mail address is: (Respondent A)
Corrections have been requested from at XXX.XXX.XXX.XXX with the following message: Ted, B 577 is not Dungannon Market Place, it is the same photo as B 575 which is Guildhall Place, Derry. It is actually one half of B575. Requestors e-mail address is: (Respondent A)
Corrections have been requested from at XXX.XXX.XXX.XXX with the following message: Ted, image c606tif (songsters in 1925) This is the Salvation Army band and singers who used that site (in front of the present Granada TV shop) every Sunday for decades for afternoon worship. Requestors e-mail address is: (Respondent A)
Corrections have been requested from at XXX.XXX.XXX.XXX with the following message: Ted, image c605 is of the Salvation Band and members marching probably from the Salvation Citadel down Bishop St. towards the Diamond. On the right side of the marchers is a WW2 air raid shelter which dates the photo in the 1940's. Requestors e-mail address is: (Respondent A)
Corrections have been requested from (ip name) at XXX.XXX.XXX.XXX with the following message: D596 I wish to add that two firefighters from Northland Fire Station in the City lost their lives fighting this particular fire. My name is (name), please do not attribute my name to this information. Requestors e-mail address is: (Respondent B)
Ted I have been browsing the Magee Collection and have thoroughly enjoyed what I have seen so far (mainly city walls and railways). I am looking forward to the rest. I hope you don't mind me adding some information and suggesting some typographical corrections on the Railways section. (Respondent D) A 314 - This appears to be the Crolly accident of 7 February 1923. A 374 - Spelling of "Anthony." B 302 - The correct name for the locomotive is "J T Mackey."

Table 2. (continued)

B 314 - Locomotive No 5 was a 4-8-4T, (not a 4-8-2T).
B 319 - Spelling of "Bridgend."
B 323 - This was a Ballast Train (stone ballast in the wagons) assisting track repairs.
B 326 - 1. Spelling of "Kilmacrenan." = 20
B 326 - 2. Does JNCT imply "Junction"? Kilmacrenan was not a junction. The diverging track is a siding.
B 333 - Spelling of "Berkhampstead" in the acknowledgment.
B 490 - Spelling of "Donegal."

Hello Ted,
I am interested in obtaining a print of b153, Watson's pub/grocery, in the community archive. JJ Watson was my grandfather. After selling the pub he had a farm at Duhhugh, Newbuildings.
Thanks,
(Respondent E)

Figure 1.
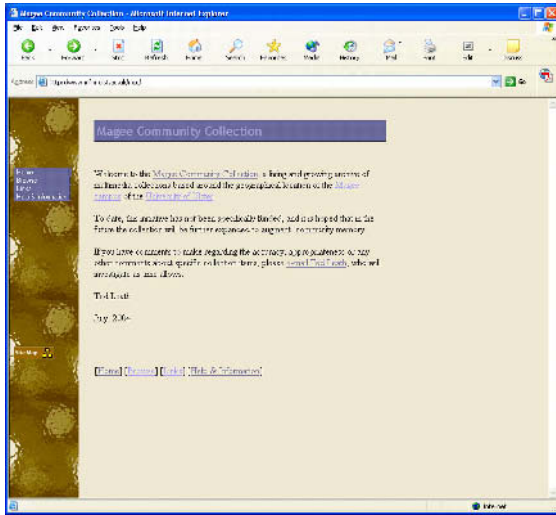
Figure 2.
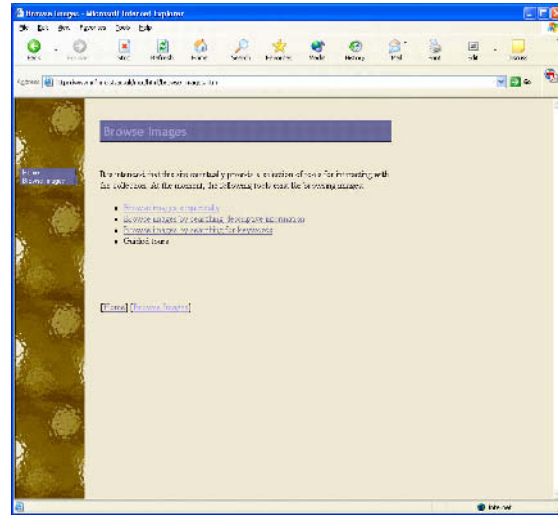
Figure 3.
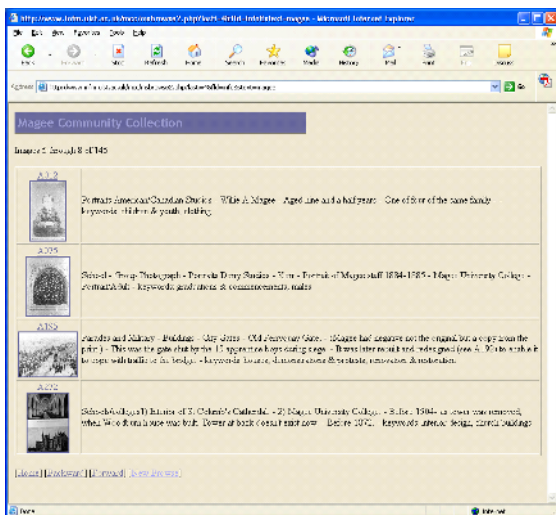
Figure 4.
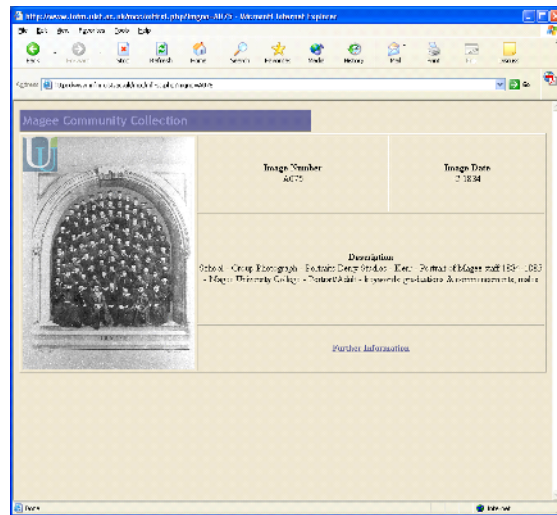
Figure 5.
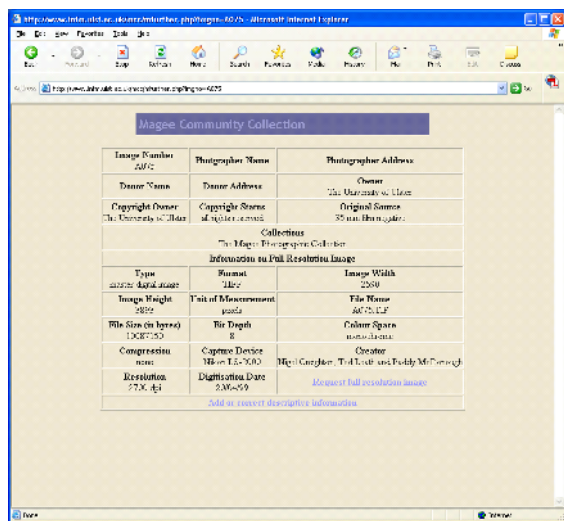
which may be searched are: Image Description, Image Number, Image Date, Owner, Collection, Copyright Owner and Copyright Status. It is hoped that in the future, members of the community will contribute "guided tours" of images with their unique commentary.

The screen shot in Figure 3 shows an example of images satisfying the search criteria of "magee" against the Image Description field in the database. Four thumbnail images are shown per screen with each image and image number serving as a link to a larger version of the image. Also displayed for the viewer are the range of images currently on view, the total number of images satisfying the search criteria, and buttons for navigating forward and backward (where appropriate) through the selected images.

The screen shot in Figure 4 shows a larger version of one of the images with some additional information, and a link to further information on another page.

The screen shot in Figure 5 shows the page with further information, providing more detail, an opportunity to request a high resolution copy of the image, and an opportunity to add to the descriptive information.

CONCLUSION

With very little ongoing attention to date, the Magee Community Collection site has been effective in eliciting and capturing community memory and given more time, effort and promotion it could become a vibrant interactive site. At the moment it attracts plenty of attention with very little effort having been expended over the last four years (other than adding additional images and community memory information into the database). In addition to archival and community memory benefits, the visibility of the collection has also lead to requests to use images in numerous books and exhibitions as well as genealogical contributions and queries. Subsequently, other local image archives have emerged or are planned due in part to the influence of the collection (Melaugh, 2002; NW Film Archive, 2004).

The collection has spawned significant interest within the community, and should prove to be a valuable and growing resource for many years to come.

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KEY TERMS

Community Memory: Communities are made up of individuals, each of whom possesses unique memories. Community Memory is the preservation, persistence and sharing of individual memories and knowl-

edge among a community through communicative means such as tradition, custom, language, writing, stories and myth and various artefacts.

Controlled Vocabulary: A set of standard terms that restricts synonyms to allow for maximum results when used with automated searching.

Domain Name System (DNS): Because humans remember names more easily than long numbers, DNS allows names to be translated into IP addresses. DNS is used to translate the name information for URLs and e-mail addresses.

Internet Protocol (IP): A protocol is a rule which guides how an activity should be performed. IP is used to define how devices can communicate across a packet-switched network of networks (including the public Internet). The umbrella suite of protocols to which IP is referred to as the TCP/IP protocol suite after two of the most important protocols in it—Transmission Control Protocol and the Internet Protocol.

IP Address: An IP address is a number assigned to a device for the purposes of identification by TCP/IP and associated protocols. It could be thought of as akin to a street address or telephone number that allows devices to communicate.

Metadata: Data about data. The use of metadata allows data to be easily organised, accessed and retrieved and also allows additional information to be appended.

Multimedia Assets: Digitised text, audio, video, images and other multimedia materials that can be stored and used.

Online Communities: Online communities consist of members connected by means of ICT, typically the Internet.

Virtual Communities: (See **Online Communities**)

Caribbean Companies and the Information Superhighway

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INTRODUCTION

With the explosion of public awareness of the Internet in the early 1990s, much attention has been focused on ways in which these new technologies can be used in developing nations. Some of the primary proponents of these initiatives include the World Bank, The United Nations Conference on Trade and Development (UNCTAD) and the Inter American Development Bank. The major themes include ways in which the Internet and electronic commerce can be harnessed for development, impediments to rapid diffusion of Internet technologies and success stories in small and medium companies.

Perhaps the most comprehensive review of these themes can be found in the United Nations Conference on Trade and Development's E-Commerce and Development Reports 2001, 2002 and 2003 (UNCTAD, 2001; UNCTAD, 2002; UNCTAD, 2003). Another rich source of information is Development Gateway's very comprehensive Web site, (http://developmentgateway.org), with links to hundreds of reports, publications and articles on the use of information and communications technologies in the development process.

Caribbean governments have also recognized the potential of the new technologies in fostering economic development. A search of the Web sites of regional newspapers turns up many stories written over the last decade promoting the Internet and electronic commerce. Once again, the major themes include the promise of electronic commerce for small and medium enterprises and factors precluding the effective utilization of the associated technologies and strategies in the region. (E-normous role in Ja for Net, 2000; Welcome to the Land of Pan, 2000).

Over last decade many Caribbean countries have witnessed massive investments in information and communications technology. Together, telephone companies, public and private corporations, cable television operators and Internet service providers have invested billions of dollars (United States currency) in new plant and equipment. These investments led to the introduction of an impressive array of new information and entertainment services. Simultaneously, many domestic banks introduced local and international credit cards.

These developments have given Caribbean businesses and residents unprecedented access to new information sources via the Internet and cable or satellite television. Their credit card accounts also give them the ability to act on advertisements shown on American television and Web sites. As such, there is a possibility that local companies could find themselves in direct competition with larger, better-financed corporations in more developed economies.

This paper will briefly highlight some salient characteristics of the English speaking Caribbean. The second section will review developments in the information and communications technology arena throughout the Caribbean during the period 1990 to 2002. This will be followed by a brief discussion of the impact that the Internet and its associated technologies can have on buyer search costs and information asymmetry. The fourth section will attempt to show how declines in information asymmetry in the region may translate into lower market shares, prices and in some cases business failure at the regional level. Evidence from U.S. industries will be considered. The section before last will also briefly examine how local retailers may benefit from the Internet and electronic commerce. Finally, the paper closes with a review of avenues for future research that will help close the knowledge gaps at a regional level.

OVERVIEW OF THE ENGLISH SPEAKING CARIBBEAN

The English speaking Caribbean is made up of former and remaining colonies of the United Kingdom. Geographically the region stretches from the Bahamas in the northwest to Guyana, located on the South American mainland. While many Caribbean nations are categorized as developing states, per capita incomes, access to health care, education and technology are significantly greater than the developing regions of Africa, Asia and Latin America. Some of these characteristics are summarized in Table 1.

Another critical characteristic of the English speaking Caribbean is the close proximity of most of the territories to the United States-the leading adopter of electronic commerce technologies and processes. Miami is a major international trade hub for the region. The flying time from Miami to any of the islands ranges between 30 minutes to

Table 1. Selected developmental statistics for the Caribbean, Africa, Latin America and South East Asia

Caribbean	Population (2003)[1]	GDP Per Capita US$[2]	Infant Mortality (per 1000[3])	Gross Enrolment Ratio (Secondary Level) 2001	Motor Vehicles (per 1000 inhabitants)[4]	Telephone Lines[5]	Internet Users as % of total population[6]
Barbados	270,000	9,486	11	103.3	268	48.1	5.56%
Bahamas	314,000	10476	18	91.5	342	40	6.75%
Guyana	765,000	936	51	90.5	100.8	9.2	12.42%
Jamaica	2,651,000	2,990	20	83.6	74	20.5	3.77%
St. Lucia	149,000	4,994	15	86	172	31.7	8.72%
St. Vincent and The Grenadines	120,000	2,940	16	72.5	117.8	22.7	4.58%
Trinidad and Tobago	1,303,000	7,031	14	70.4	219	24	10.59%

Africa							
Nigeria	129,000,000	435	79	32[7]	.6	.5	0.16%
Ghana	20,922,000	265	58	37.7	10.5	1.2	0.19%
Democratic Republic of Congo	52,771,000	91	120	18.4	No Data	No Data	0.01%
Mauritania	2,893,000	353	97	21.7	11.2	1	0.35%
Kenya	31,987,000	367	69	32	16.7	1	1.56%
Somalia	9,890,000	110	118	5.9[8]	No Data	.3	0.10%

Latin America							
Brazil	178,470,000	$2,925	38	107	111.9	21.8	8.01%
Argentina	38,428,000	$5,267	20	99.6	197.7	22.4	10.67%
Chile	15,805,000	$4,310	12	85.5	135	23.3	19.63%
Peru	27,167,000	$2,053	33	81.7[9]	50.1	7.8	7.36%
Ecuador	13,003	$1,666	41	59.2	47.1	10.4	3.87%
Venezuela	25,000,000	$3,134	19	68.6	100.2	10.9	5.08%

Asia							
China	1,300,000,000	$918	37	68.2	10.2	13.7	1.19%
Philippines	80,000,000	$925	29	81.9	34.3	4.2	2.50%
Indonesia	219,883	$678	42	57.9	27.6	3.5	1.82%
Malaysia	24,425,000	$3,748	10	69.6	18.8	19.8	26.61%
Thailand	62,833,000	$1,865	20	82.8	126.1	9.9	7.64%
Vietnam	81,377,000	$416	34	69.7	.7	3.8	1.84%

the Bahamas and 4.5 hours to Guyana. Each country is served by daily flights to the United States. Several shipping lines offer scheduled service between the United States' eastern seaboard and each country.

Selected ICT Developments in the Caribbean (1990-2002)

Telephone Companies

The largest ICT investor in the region is almost certainly Cable & Wireless (C&W) and its regional subsidiaries. C&W subsidiaries have invested billions of US dollars in fiber optic backbones, digital switching technology and cellular networks (C&W Deal Signals New Invest-

ments,1999). Most have joined international consortiums such as the Americas I and II undersea cable projects (TSTT to spend $540 million on upgrade, 1998).

Cable television companies have also invested heavily in new plants and equipment. Several are positioning themselves to enter the voice market when the telecommunications environment is liberalized. Caribbean consumers also have access to US television programming via DirecTV Latin America.

The Internet

Internet access is now firmly established in the English speaking Caribbean. Consumers can now access the Internet though dial-up connections, cyber cafes, schools,

offices and kiosks (Net Kiosks Online, 2000). Most Islands now have at least one local Internet Service Provider, and the bigger territories have up to ten. Competition between the ISPs is fierce and prices have declined rapidly (Net War Heats Up, 2000) in the late-1990s before stabilizing.

Credit Cards

Consumers in the English speaking Caribbean were also able to open local credit card accounts for the first time during the 1990s. Visa International's Web site indicates that, as of March 31, 2004, the company had over 125 million credit card accounts in Latin America and the Caribbean (http://corporate.visa.com/mc/stats/statistics-cardsissued.shtml).

LITERATURE REVIEW

Information Asymmetry and Buyer Search Costs

One of the most powerful effects of the Internet is in its ability to reduce information asymmetry by lowering buyer search costs. Information asymmetry is thought to occur when one party to a transaction has more relevant information about that transaction than the other party (Akerlof, 1970). While Akerlof's initial original article focused on asymmetric knowledge as it relates to quality, we can almost certainly apply his analysis to asymmetric knowledge as it relates to prices in different markets.

Buyer search costs refer to the cost incurred by the buyer to locate potential sellers, product information and pricing. These search costs include expenditure on driving to retail outlets, telephone calls, magazine subscriptions and the opportunity cost of the time spent searching (Bakos, 1997). The premise is that information and communications technology decreases search costs, allowing customers to easily compare prices from various potential suppliers (Bakos, 1991). Thus the reduction in buyer search costs leads to reduced information asymmetry which in turn should lead to more intense price negotiations, and correspondingly lower prices.

Several possible scenarios can be anticipated. First, the Caribbean consumer discovers that a product (called A) sold in a retail outlet in the Caribbean for X can now be purchased online for .3X (inclusive of shipping and handling). Second, the consumer discovers a superior grade of the product (B in this case) not available for sale in Caribbean retail outlets but available online for the same price as A retails for in the nearest shopping center. The consumer is then faced with four possible alternatives. First, she can choose to purchase at the local retailer knowing that she is probably not getting a good price. Second, she can forgo purchasing the item altogether. Third, she can bypass the Caribbean retailer and purchase from an American retailer. Finally, she can negotiate with her local retailer for a better (lower) price or better quality. Options two and three leave the retailer with no sale. Option 4 results in a sale but at a reduced price and perhaps reduced profit margin. Option 1 preserves the status quo, but may leave the consumer dissatisfied.

Recent work in the insurance industry suggests that the Internet has reduced prices (premiums) for term life insurance policies, a fairly homogenous product by 8% to 15% "*and increased consumer surplus by $115-215 million per year*" (Brown & Goolsbee, 2000).

These studies concentrate on developments in the United States. There is a dearth of literature of similar studies carried out in the developing world in general or the Caribbean in particular. However, it seems reasonable to assume that Caribbean businesses and consumers are using the Internet to search for information relating to planned purchases. Prior to the Internet, the primary source of information on a wide variety of products and services would have come from the local distributors/agents and producers. Finding "off island" sellers and comparing prices would have required expensive long distance phone calls, faxes, and sometimes even site visits.

Some of the primary questions relating to downward pricing pressure include the following:

1. To what extent have prices paid by Caribbean consumers and businesses for various goods and services declined as a result of Internet access?
2. If there have been price declines, are they fairly uniform over industry, or do they vary from industry to industry?
3. Do Caribbean buyers perceive that they now have more power to negotiate lower prices vis-à-vis traditional suppliers, given increased access to information?
4. Are regional firms aware of any downward pricing pressure and, if so, have they attributed this development to reduced information asymmetry in favour of the buyer?

Channel Disintermediation

The threat of disintermediation is another issue facing Caribbean companies. Option 3 above specifically refers to this threat. Recent business and academic literature has focused on the ability of producers and consumers to conduct transactions directly with each other, thus

doing away with intermediaries in the supply chain. The rationale was that as the Internet dramatically lowered transaction and search costs, consumers and producers would now find it economical to do without intermediaries (Gellman, 1996).

Subsequent studies suggest that Gellman's hypothesis is only partially correct (Brown & Goolsbee, 2002). What seems to be happening is that while some traditional intermediaries become less relevant (Traditional Travel Agents), new intermediaries are springing up in many industries-for example, Expedia.com and Travelocity. Reintermediation is the term applied to the emergence of new intermediaries based on the Internet. What seems to be occurring is that existing business processes and business models are being challenged by more efficient variants. Firms that are able to use the Internet to improve business processes and value systems will prosper. Firms that cannot will disappear over time.

The question then is will Caribbean companies, with limited financial, human and technological resources, be able to evolve quickly enough to adapt to a more competitive environment?

Studies on disintermediation have focused on the United States and other developing countries. A search of the EBSCO Host Business Source Premier and Academic Search Premier databases yielded 219 references to the term "disintermediation" but not one of them referred to developing nations.

However, Coulthard (2000) reported that studies in Australia indicate that while electronic commerce yielded "unequivocal" benefits for 30 out of 57 regions, 24 out of 57 experienced an increase in economic activity, but a decrease in employment. The remaining three experienced declines in economic activity and employment. In trying to explain the differences, Coulthard cites the study conducted by Australia's National Office of the Information Economy which states that, "*What matters is the composition of the region's underlying economy…regions more dependant on just a few key activities are vulnerable to an overall contraction as a result of greater use of eCommerce*" (Coulthard, 2000, p. 2, italics added).

Coulthard seems to attribute this decline to the disintermediation of companies located in small regional towns in rural Australia. While Australia on the whole is significantly more developed than many Caribbean nations, rural Australia probably shares several traits with the islands of the Caribbean. The most important of these is a reliance on a few industries for employment and earnings-primarily farming, mining and tourism.

Some of the preliminary questions relating to disintermediation include the following:

1. Is disintermediation taking place in the Caribbean?
2. If so, what industries are most vulnerable?
3. What industry attributes raise the risk of disintermediation and what attributes lower the risk?
4. Do local companies perceive that they are loosing market share to their suppliers or to larger "hypermediaries"?

Not All Bad

Despite the gloomy scenarios described above, some Caribbean companies will benefit from the diffusion of the Internet throughout the region. There are many success stories on www.developmantgateway.org pointing to individuals and companies throughout the world that have been able to develop export markets through contacts made over the Internet. Like UNCTAD (2001), The United Nations Development Programme in its Human Development Report 2001 highlights the many ways in which the Internet can benefit companies in developing countries (UNDP, 2001).

The United Nations, the World Bank, and many other development agencies focus primarily on export development. However, Caribbean companies who choose to focus on their own domestic markets can also benefit from the Internet. These companies, like consumers, benefit from a reduction in information asymmetry brought about by lower search costs. Consequently, they can source higher quality goods at lower costs and at lower expense. To the extent that selling prices in the domestic market remain stable, these lower costs translate to higher profitability. If regional companies pass these savings onto consumers, as they are likely to do in a competitive environment, then consumer welfare improves.

A key question that arises, however, is that even with these benefits, can Caribbean companies reduce costs, improve assortment and convenience quickly enough to compete with the giants corporations in North America, Europe and Asia?

CONCLUSION

Regional investments in ICT and the diffusion of the Internet in the English speaking Caribbean when considered alongside the literature on the effects of reduced search cost and information asymmetry suggest that there is the potential for negative impacts in the profitability of Caribbean business organizations. However, while the potential for negative side effects are prevalent, the author is not aware of any attempts to study these phenomena in any detail.

Promising areas for future research include:

1. Longitudinal studies on consumer and business attitudes about, and use of the Internet for, pre-purchase research on an island-by-island basis. These studies will show changes over time and regional variations between countries.
2. Comparisons of prices paid by Internet users versus those paid by non-users in selected product and service categories.
3. Longitudinal market share studies in selected product and service categories. These studies will assist in determining if regional businesses are being squeezed out of the value chain.

Without the data provided by these types of studies, economic policy makers and business executives will have an incomplete understanding of the full impact of electronic commerce in the Caribbean.

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KEY TERMS

Buyer Search Costs: The financial, time and psychic costs incurred by a buyer as he or she searches for any type of information on a prospective purchase. These could include trips to the mall, telephone calls, purchase of reviews, etc.

The Caribbean: Also known as the West Indies, refers to a group of islands that border or are near the Caribbean Sea. This archipelago stretches southeastward from Florida to the north eastern coast of Venezuela. The Bahamas, Turks and Caicos and Guyana, though not geographically adjacent to the Caribbean Sea, are normally considered part of the Caribbean due to shared history, culture, language, etc.

Disintermediation: Disintermediation refers to the removal of intermediaries from the Supply Chain. The possibility of disintermediation is said to occur when there is market transparency and the final buyers become aware of manufacturers' prices intermediaries.

Electronic Commerce: Electronic Commerce refers to the buying, selling and servicing of goods over computer networks. These networks can be either public, such as the Internet, or private, such as the private Electronic Data Interchange (EDI) systems used by large companies.

Information and Communications Technologies: ICT referrers to the computing and telecommunications hardware and software used to capture, process, transfer and store data.

Information Asymmetry: A situation where one party to a transaction has more information than another party. In many cases it is the seller who has more and better information about the quality and underlying costs of a product than the buyer.

Internet: A global public network that utilized the TCP/IP protocols to transfer data from one computer to another. The Internet is often referred to as a "network of networks' as it is made up of thousands of smaller privately owned networks.

Reintermediation: The process of using ICT technologies to identify and exploit new intermediary roles in the supply chain. Reintermediation strategies are often based on providing superior service or convenience to buyers. New intermediaries that have taken advantage of the Internet to build large organizations include Amazon.com, eBay and iTunes.com. Reintermediation is often seen as the opposite of disintermediation.

ENDNOTES

1. Source: Population projections for 2003 were published in *World Population Prospects: The 2000 Revision*.

2. Source: United Nations, National Accounts Statistics: Analysis of Main Aggregates, 1998-1999, (Series X, United Nations publication, annual) and United Nations, Statistical Yearbook, (Series S, United Nations publication, annual). In order to have comparable coverage for as many countries as possible, the official GDP national currency data are supplemented by estimates prepared by the Statistics Division, using additional data from national and international sources.

3. Source: Table A.27 of the United Nations publication *World Population Prospects: The 2002 Revision* (United Nations publication). See also: http://esa.un.org/unpp.

4. Source: United Nations ,Statistical Yearbook (Series S, United Nations publication, annual). Supplementary data obtained from AAMA Motor Vehicle *Facts and Figures 1997* (Detroit, USA) and Auto and Truck International, *1999-2000 World Automotive Market Report* (Illinois, USA).

5. Source: International Telecommunications Union, *World Telecommunication Development Report 1999-2001*. See also: http://www.itu.int/ITU-D/ict/statistics.

6. Source: International Telecommunication Union, *World Telecommunication Indicators* (Geneva 2002) See also: http://www.itu.int/ITU-D/ict/statistics/.

7. Source: World Bank EdStats, Global Country Data, Summary Educational Profiles (http://devdata.worldbank.org/edstats/cd1.asp). Latest Date for 1995.

8. Source: World Bank EdStats, Global Country Data, Summary Educational Profiles (http://devdata.worldbank.org/edstats/cd1.asp). Latest Date for 1995.

9. Source: World Bank EdStats, Global Country Data, Summary Educational Profiles (http://devdata.worldbank.org/edstats/cd1.asp). Latest Date for 2000.

Challenges to Community Informatics to Bridging the Digital Divide

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COMMUNITY INFORMATICS AS A MECHANISM FOR BRIDGING THE DIGITAL DIVIDE

Community Informatics (CI) is the application of ICT to overcome the "digital divide" both within and among communities (Gurstien, 2000). Taylor (2004) further asserts that CI is a connection between theory and practice in community networks. In this case, CI refers to the use of ICT for community practice, which Glen (1993) elaborates as encompassing concepts of community development, community service delivery and community action. With the emergence of CI, it is possible for remote communities to enjoy the benefits of ICT for economic and social development. For example, in India, the M.S. Swaminathan Research Foundation established six Village Information Shops, which enabled rural families to access and exchange a basket of information using ICT (Balaji & Harris, 2000). In Costa Rica, there is a project involving the Massachusetts Institute of Technology (MIT) to implement "digital town centers" in remote villages (Harris, 1999).

The pervasiveness of the Internet has brought ICT to large numbers of people who have never used them before, particularly where community-based telecentres have provided access to ICT in developing countries where there is very little likelihood of individuals owning their own computers. CI as a mechanism to overcome the digital divide, particularly in developing countries of Asia present many challenges, some of which are highlighted here.

It is estimated that nearly 75% of the population of Asia is reckoned to be living in rural districts. Dysfunctional patterns of technology diffusion serve to prevent the poor, mostly rural, majority populations of developing countries from benefiting from ICT to the same extent as their educated urbanised compatriots. Although the information revolution threatens to increase income inequity, nationally and internationally, it can provide tools, which can dramatically reduce isolation and poverty and alleviate its worst effects. Contemporary ICT can now be used to integrate rural and poor urban communities into economic life, thereby raising income, and improving their quality of life. Satellite network, wireless communications, public telephones and community information centres, cyber kiosks, or telecentres are effective arrangements for reducing information inequality (Harris, Bala, Songan, Khoo & Trang, 2001).

The World Bank recommends a systematic approach to the application of ICT to the needs of rural communities (World Bank, 1998). In order to support ICT adoption that will contribute to rural development, it is essential to begin with the needs of the rural community. As a first step, a feasibility study is required in order to:

1. Identify the needs and priorities of rural communities for such areas as agriculture, education, commerce, natural resource management, health and the like.
2. Determine the types of information needed to help meet those needs, including information gath-

ered from the rural population and transmitted to policy-makers and project designers, and information shared among rural communities.

3. Determine the gaps between the information currently available and what is needed.

4. Determine how ICT can close those gaps and build valuable synergies by mobilising information across sectors.

Evidence suggests that rural dwellers have more to gain than do urban dwellers from any increase in the density of communications capability (International Telecommunications Union, 1998). For example, the economics of telecommunications are related to distance. The greater the distance from communities of interest, the greater the savings in travel costs and time which individuals enjoy with improved communications. Unit gains from additional telephones are greatest where density is at its lowest. The greatest social payoff from telecommunications improvements, therefore, is found in rural and isolated areas. Unfortunately, these areas do not generate as much total revenue for private telecommunications providers as do high density urban areas, even with higher revenue per individual subscriber. Consequently, special arrangements and incentives are needed to upgrade telecommunications networks in rural and remote areas, and such facilities have to be designed to keep capital, operating and maintenance costs as low as possible. In gaining access to information, geography alone places rural people at a disadvantage compared to urbanites before communications are taken into account.

THE e-BARIO PROJECT

The e-Bario project provides the context for analysis of the challenges to CI in an effort to bridge the digital divide. The project is being coordinated by the Universiti Malaysia Sarawak (UNIMAS), and financially supported by Canada's International Development Research Centre (IDRC) and the Malaysian Institute of Microelectronic Systems (MIMOS). Conceptualized and inspired by a group of researchers from UNIMAS, e-Bario seeks to demonstrate the many ways in which ICT can be used to help marginalized communities in Malaysia develop socially and economically. It is a development project that utilizes computers, telephones, and VSATs to connect villagers in the remote village of Bario to the Internet. The e-Bario project is one of the most notable of Malaysia's Internet development initiatives.

Located in a remote area in Sarawak, Bario exemplifies the disconnected portion of the digital divide. For instance, while most of the district's 1,200 inhabitants

have heard of a computer, more than 90% have never used one, let alone logged onto the Internet (Songan, Harris, Bala & Khoo, 2000). Thus, Bario met all of the experiment's qualifications for the pilot project, and presented a challenging environment in which to test the idea of rural Internet connectivity in Malaysia. Initially, the researchers conducted a baseline study to help them gain an understanding of the cultural, social, information and economic dynamics of Bario. Not only did the initial research demonstrate that the residents were hungry for new information resources, it suggested that the majority of teachers and students were well prepared for ICT adoption. For instance, it was found that each of the 13 secondary school teachers who have been polled had an intermediate to advanced level of IT understanding (Khoo, Tingang Trang, Sia, Songan, Harris, & Bala, 2000). An IT literacy program was established to help them expand their knowledge of how to use computers and the Internet.

Realizing the importance of community engagement and empowerment, the researchers designed the e-Bario project around a participatory development model from the beginning (Bala, Harris & Songan, 2004). While the project was inspired by the researchers from outside of Bario, they made sure that throughout the implementation process community leaders would consistently provide input to its evolution. Given their understanding of social and cultural dynamics, the community leaders have also been actively involved in identifying ways to sustain the project once the researchers withdraw. The e-Bario project also clearly demonstrates the effectiveness of how the public and private sectors can work together to sensitize rural communities to the capabilities and uses of new technologies, and the many ways in which ICT can improve the lives of marginalized groups.

The e-Bario project highlights the various components of creating a sustainable ICT-focused development program. For instance, the project demonstrates that ICT cannot just be "dropped" in a rural village, but needs to be accompanied by training and education to be successful and sustainable. Despite the imminent success of e-Bario, such grassroots ICT development initiatives remain largely experimental, as the long-term effects on a given society are not readily apparent. However, it is obvious from the first three years of the project that a participatory approach is a prerequisite for sustainability.

CHALLENGES TO COMMUNITY INFORMATICS

Based on the experience of the e-Bario project, the challenges that are faced in using ICT for bridging the

digital divide are largely related to the aspects that are described below (Bala, Songan, Khairuddin, Harris & Khoo, 2002).

Costly Infrastructure, Connectivity and Use

Non-existence and under-developed telecommunications infrastructure remains an important impediment to the expansion and use of ICT in the rural areas. It restricts access and keeps it expensive. While computer prices have declined, telecommunications continue to be costly and of limited availability. The financial cost of introducing ICT in rural areas, which have access to meagre or non-existent telecommunications service is costly. In Bario, for instance, there was no basic infrastructure for ICT implementation. A few VSAT ground stations have to be set up to enable Internet connectivity. The research team had to work from scratch to explore ways and means to ensure 24 hours uninterruptible power supply. The team resorted to solar panels and a diesel generator to ensure stable power supply at the telecentre. The installation of technologies and especially equipment to secure access to the Internet is usually beyond the community's financial means.

Language of Resources

The contents of training manuals and the materials that are available on the Internet are primarily in English, which are not understood by many people in the rural areas. In the E Bario project, an IT Literacy Training Programme in conjunction with a local company was introduced at the schools for teachers, students, and other members of the community. The project's trainer had already conducted a one-month intensive training programme in Bario. Although the members of the community had tremendous eagerness to learn, their little command of the English language, which undeniably is the IT language, presented a huge challenge to many of them. As such, the trainer had to redesign the present manual into a simplified manual and in *Bahasa Malaysia*. Additionally, the resources that are found on the Internet are mostly written in English, which pose a challenge for the rural people to comprehend due to their poor command of the English language.

Coordinated Approaches and Skilled Human Resources

The application of ICT-based development efforts at community levels implies new skills and approaches from a variety of professions, some of which challenge

traditional practices in several disciplines. The e-Bario project is experimental in many ways. Nothing like it had been known to exist in Malaysia. The close working organisation of the multi-discipline research team and the harmonious relationships it has with the Bario community facilitated the progress of the project's goals. However, as a result of an analysis of the project's boundary partners, it was recognised that there was a wide range of institutions and individuals who were all potential stakeholders in the project and in what it potentially represented if it were to be replicated on a wider scale. As project implementers and promoters, the research team encountered a huge range of skills, disciplines and professions as part of its regular deliberations. Members had to be capable of associating and dealing with illiterate farmers, local administrators, technicians, small businessmen, officials, local and national community representatives, senior government officers and government ministers. Community benefits were identified that implied a range of agencies that needed to be mobilised and coordinated for such benefits to emerge. Thus, no single agency should carry responsibility or authority for community development with ICT.

Awareness in Development of ICT among Rural Communities

Although the Government of Malaysia has been aggressively promoting ICT as one of the major components of its drive to fully developed nation status by the year 2020, the baseline survey indicated that 99% of the people in the Bario community had no knowledge of the Internet (Songan, Harris, Bala & Khoo, 2000). The significance of this emerged in the context that the Government has been promoting the advantages of the "k-economy" in which dependence on physical resources will give way to the exploitation of knowledge resources in the future development of the economy. Even though ICT is the subject of a popular song frequently heard on the radio, which indicates a wholesale national commitment to ICT, it was surprising, and a little alarming, to discover that an entire community have heard little of such developments. Despite its remoteness and isolation, it seemed reasonable to suppose that Bario was not alone in this finding.

CONCLUSION

CI as mechanism for bridging the digital divide enable people to acquire information anytime, anywhere and on anything, which they can use to develop themselves

socially and economically. However, the application of CI in community development brings about many challenges, especially in developing countries in Asia. Access to and use of ICT remain extremely uneven between the rural and the urban areas. This disparity-the so-called "digital divide"-is the greatest challenge for CI in the process of socioeconomic development. The challenge of the digital divide brings about other challenges, such as those revealed by the e-Bario project. The experience from the e-Bario project has demonstrated these challenges, and they can serve as a lesson for those who are involved in CI for community development in other developing countries in the world.

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KEY TERMS

Community Informatics: The process of using ICT in social development programs to help a community develop economically, socially and culturally.

Digital Divide: The gap that exists between those who have in the urban areas and those who have not in the rural areas in terms of their access to ICT (telephone, computer and Internet access) and related services.

e-Bario Project: The e-Bario Project is a research initiative undertaken by Universiti Malaysia Sarawak (UNIMAS) to demonstrate the many ways in which ICT can be used to help marginalized and remote communities in Malaysia to develop socially, culturally and economically.

Internet: The Internet is a global communications network consisting of thousands of networks typically interconnected by fiber optic cabling or wireless applications that allows access to the World Wide Web.

Participatory Development: A development approach in which members of the community are actively involved in the planning, implementation and evaluation of community development programs.

C

Telecentre: A public-access facility providing electronic communications services, especially in marginalized or remote areas where commercial development of ICT is not prevalent.

VSAT: Very Small Aperture Terminal (VSAT) is a very small earth station used for receipt of broadcast transmission of data or video as well as interactive communication with a host computer or database for a multitude of applications.

Choosing Online Learning Communities or Collaborative Learning

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INTRODUCTION

The adoption and innovative use of computer-mediated communication (CMC) technology can have positive outcomes for regional development (Ashford, 1999; Harris, 1999; Mitchell, 2003). Especially when it involves the use of online environments, CMC can lead to what Gillespie, Richardson, and Cornford (2001) refer to as the "death of distance," and is likely to boost opportunities for growth in e-commerce, e-business, and e-learning in the regions. Although such growth depends on continuous learning and innovation (Rainnie, 2002), actual opportunities for learning and training can be affected by approaches to the provision of online learning that are unnecessarily rigid and inflexible. Online education and training methods that include strict participation requirements can have the effect of marginalizing and excluding those learners who cannot engage with inflexible and regimented learning contexts. This represents an important problem in regions, because of limited access to other learning contexts.

This article focuses on one major reason given by educators who employ mandatory learner participation in online learning contexts: the notion that individuals learn more effectively when they become members of online "communities." We critique this notion, and we hold that the concept of "community" is more of an ideological, rather than a practical, one. Indeed, it is hard to see how effective online learning must require membership to an online community, and it becomes even more unclear how mandatory online participation and interaction promotes learning. In the event, the notion of a "community of learners" is awkward when attempting to describe an online learning environment that facilitates (rather than mandates) participation and interactivity. Rather, when participation takes place on learners' own terms, then we might describe the learning context as a collaborative online learning environment.

WHY "COMMUNITY"?

New technologies enable innovative approaches to teaching and learning and also provide means through which learners might be empowered to control and direct the processes through which they learn. It is even predicted that traditional distance education will all but disappear and will be replaced by "distributed learning," or flexible learning (Carr-Chellman & Duchastel, 2001). Online learning assumes a degree of participation through CMC in activities that require electronic text writing and reading, online research, online assessment tasks, and sometimes the use of visual learning aids such as digital objects. The advantages that can be offered by online learning environments (OLEs) are numerous and include flexible participation, unlimited access to resources, and means to personalize online presence (see also Kessop, 2003; Morse, 2003).

The idea of online learning "communities" tends to accompany notions of what an online learning environment should be, and often "participation" by learners in online communities is taken to be necessary. In practice, these translate to specific interactivity and participation requirements being imposed on students, who are often required to participate in structured and controlled online learning platforms and systems. This appears to generally be the result of an unreflective (taken-for-granted) notion that it is a sense of community that helps create an environment that facilitates learning. This notion can be found in routine, but often-unsubstantiated statements within the literature. For example, in discussing advantages of asynchronous communication, Carr-Chellman and Duchastel (2001) stated: "Such dialogues lead to the formation of true learning communities, within which adult students share their real world experiences and learning outcomes, thereby profiting all participants …" (p. 153). The problem lays in defining a "true learning community" and why there must be a community in order for learners to share their real-world experiences online.

The activity of learning may be described as a process of becoming part of a community of knowledge (McPherson, Nunes, & Harris, 2002: online), which is not the same as a "community of learners." The latter can be taken to mean a group of learners with a shared purpose, good means of communication, and a "climate" that facilitates justice, discipline, and caring (Brown, 2001). However, it should be noted that mandating the construction of an online community is not necessarily the same as understanding that learners are capable of learning, collaborating, and creating structure (even community) for themselves. For example, "Discussions become active and productive when students themselves identify a real task of direct benefit to them" (Zimmer, Harris, & Muirhead, 2001, pp. 3.6–3.7).

However, although learner interaction may be required when there is value-laden information to be shared in the online learning context, it is hardly necessary when highly structured and consensual information is delivered (Carr-Chellman & Duchastel, 2001, p. 155). Further, in an online learning environment, there are two types of interaction: interaction with the information available, and interaction with the social setting involved. The level of interaction with the social setting is influenced by the learner's level of interest to interact (Carr-Chellman & Duchastel, 2001, p. 155). Another way to define interaction is through "Moore's Theory," in which three dimensions of interaction are identified: learner-to-instructor, learner-to-content, and learner-to-learner (Huang, 2002, p. 407; Curtis & Lawson, 2001, p. 23). The point is that effective interaction does not require the existence of "community."

Participation

"Participation" is an important concept in online education but has two different meanings. The first, which we label *normal participation*, refers to interaction with other learners and the online platform on the learner's own terms. The learner may or may not choose to communicate with other learners, and interacts with the OLE when he or she deems it necessary. Normal participation does not mean that there are no rules to be followed, such as communicating with instructors at specific points in the course, or fulfilling particular assessment-related tasks individually or with other learners. Normal participation refers to learner-controlled processes.

The second meaning of participation in online learning contexts refers to required interaction with other learners and with the OLE beyond the need of the learner to do so. Often, the formal outcome for learners is conditional on this type of participation, which we label *mandatory participation*. The learner cannot choose a level

of participation in the online course, and often has little control over the learning environment. Invariably, educators that employ mandated participation also use a limiting and uninspiring OLE, in which participants cannot do more than perhaps exchange text messages in synchronous and asynchronous online forums, search for resources, or complete online quizzes.

What is this Thing Called "Community"?

Typically, an online "community of learners" is defined as a set of online relationships that result from social interaction and that also promote learning. For example, Nichani observed that:

One aspect that characterizes communities is the nature of the social interactions between members of the community. People form communities to pursue shared goals or ideals. In the act of pursuing these goals and ideals, they form relationships. It is the nature of the social interactions through these relationships that sustains the community, or in the case of a community of learners, sustains learning. (Nichani, 2000, p. 2)

Sometimes educators find that their online courses develops into "intimate communities of learners", in which "… it is common for participants in online courses to develop a strong sense of community that enhances the learning process" (Kessop, 2003: online). However, there remains a lack of more consistent evidence that such communities develop routinely. Online communities are not easily achieved, not least because many learners prefer to be recluses rather than participate in online community-building activities. Nichani (2000) reports studies that describe reluctance by learners and even educators to participate regularly and enthusiastically in online activities. For example, a series of four studies found that in online courses at a U.S. university,

… an overwhelming majority of students never posted messages on newsgroups, nor did their instructors. In addition, a large majority of students rarely read what others had posted (Nichani, 2000, p. 2)

It is worth digressing briefly to consider the social complexity encompassed by the term "community" when used from a scholarly perspective, which stands in contrast to how it is often used in online learning contexts. Indeed, almost half a century ago, a sociologist found no less than 96 definitions for community (Hillery, 1955). There have been many more explanations offered since, but Etzioni's is perhaps the most popular:

Community is defined by two characteristics: first, a web of affect-laden relationships among a group of individuals, relationships that often criss-cross and reinforce one another ... and second, a measure of commitment to a set of shared values, norms, and meanings, and a shared history and identity—in short, to a particular culture. (Etzioni, 1997, p. 127)

In light of this explanation, it would, therefore, be rather difficult to imagine that a collaborating group of online learners can be viewed as a "community." Rather, it is likely that the term is used in its ideological sense, to stress a need for participation, involvement, responsibility to the group, interactivity, and such. Allegiance to such a community is something that we have to be made aware of and often requires the manipulation of symbols (Rose, 1999).

MANDATORY PARTICIPATION: CAN IT EXCLUDE?

There is little known about the effects of mandatory participation, as when, for example, Western-centered approaches to online education are employed in the context of cultural differences (Morse, 2003, pp. 37-38). In such approaches, educators may use strategies that achieve a modicum of participation regardless of the potential to exclude some learners from courses. Bates reflects on one means to achieve this, and the possible impacts:

We reward through grades students who participate actively and work collaboratively through discussion forums, and this will seriously disadvantage students for whom this is an alien or difficult approach to take, even for those willing to work this way. I therefore find myself wondering to what extent I should impose "western" approaches to learning on students coming from other cultures, while acknowledging on the other hand that this "new" or different approach may have attracted them to the course in the first place. (Bates, 2001, pp. 129-130)

In the sense that it is grounded in the social and cultural world of the learner, learning does not occur in isolation (Williamson & DeSouza, 2002). However, educators using Western approaches may imagine that the creation of online communities can effectively replace the learner's cultural context. Rather, it is likely that the type of online interaction that learners find useful is collaborative learning. This is not to be confused with "community learning," or learning as a member of a particular community. Indeed, writers can discuss collaborative online learning without referring to "communities of learning" (e.g., Curtis & Lawson, 2001).

Constructivist Pedagogies?

Approaches to online education that employ the notion of "community" tend to be interpreted as approaches that promote constructivist learning. In constructivism, "…the goal for the learner is to build, or re-invent knowledge. Ordering and re-ordering knowledge, testing it out and justifying this interpretation are the underlying principles of constructivist practices" (Gold, 2001, pp. 37–38). Nevertheless, the constructivist approaches most commonly adopted fail to recognize or value alternative ways of interpreting or valuing knowledge, thus having the capacity to disadvantage students from different cultural or socioeconomic backgrounds, such as indigenous people or members of a minority migrant community (Williamson & DeSouza, 2002: online).

Indeed, Goodfellow, Lea, Gonzalez, and Mason (2003: online) suggested that "cultural otherness" (unique form of a sense of "being") has an important place in learners' perceptions of their experiences in online courses. Often this is not discernible to instructors and moderators, and in courses with students located in many areas of the globe, this can become a significant issue for learners. For example, there is an important difference between the "structure-focus" of the U.S./Anglo style of academic writing, and the "content-focus" of the traditional European approach: "The former is manifested in concise, single-issue, empirically-based argument, and the latter in elaborate, digressive, abstraction-based discourse" (Goodfellow et al., 2003: online). Especially in courses at the postgraduate level, some European learners may find it difficult to adapt to, and participate in, online courses in which they are expected to use communication protocols that are alien to them.

A further clouding of the issue is the tendency of Western research to investigate constructivist approaches in contexts that are not easily generalized to all online learning contexts (this is more typical of U.S.-based research) (e.g., Gold, 2001). Some research even suggests that some learners feel discomfort when faced with an increased degree of freedom from "… instructor-formulated learning objectives, and participation in instructor-led learning activities" (Herrington, Oliver, & Reeves, 2002: online).

SOLUTIONS?

The term "community of learners" implies having to belong to a social group, and this is interposed on a set of implied obligations and rights in respect of a group of people with whom an individual learner is likely to have no significant ties. While learning is a social activity,

which is dependent on interaction with others (or at least with traces of social symbols encountered in the context of online technologies), it is not necessary to be a part of a community in order for learning to occur. For most learners, the online experience is most often likely to require a relationship with an "It," rather than with a "Thou" (Buber, 1970). (Here we refer to the distinction made by Martin Buber between "I–It" and "I–Thou" types of social relations.)

Therefore, rather than attempting to build a "community," online educators might better focus on making the technology work for all learners, regardless of their cultural or social contexts. An example of how this can be achieved is the Collis and Moonen (2001, p. 70) "something for everyone" approach that focuses on how CMC might benefit learners, instructors, and educational institutions within online learning contexts. In essence, effective online learning is not likely to be influenced by a sense of "community" as much as by a well-structured approach to providing opportunities for learners to participate and interact on their own terms in the online learning environment. Learner support, then, is more important than "community" membership. Essentially, as Salmon (2000, pp. 25-37) points out, such support consists of facilitating access and motivation, online socialization, information exchange, knowledge construction, and learner development.

CONCLUSION

Critiquing the concept of community as is often used in the context of online learning is necessary in order to illuminate the tenuous link between "community" and effective learning through mandatory online participation. It appears to be true that within the context of digital (internet) communication, the "…ability to connect with people who have similar interests…" is seen as "true community" (Brown, 1999: online). However, "…the term has been diluted and debased to describe even the most tenuous connections, the most minimal interactivity" (Nichani, 2000, p. 3). It has been argued that the concept of community, thus employed, can serve to obscure the possibility that access to online teaching for some learners can be limited. On closer inspection, this highlights such issues as the marginalization of learners from different cultural backgrounds or regional contexts.

The article is not denying that interaction and participation are important, or even crucial, to processes of learning, nor is it implying that learners do not interact in the absence of mandated interaction. Rather, it makes the point that interaction/participation do not necessarily indicate "community" (and *vice versa*). Ultimately, it is

contended that it is not as important to become overly concerned with creating communities as it is to attempt to understand all learners, and to use the new technologies to empower them to shape their own learning environments, and support them as they interact and participate on their own terms to create collaborative, rather than communal, learning contexts.

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KEY TERMS

Community: A generalized grouping of individuals who are more or less bound together by social relations on the basis of one or more shared commonalities, such as kinship, cohabitation, economic position, occupation, friendship, or shared ideas. Community is not the same as society, and membership may be ascribed, and individuals may identify with it.

Learning Community: A group that is characterized by its members' collective capacity and willingness to engage in similar learning activities.

Mandatory (Online) Interaction: The requirement that learners must communicate directly and in a prescribed way with other online learners so as to satisfy the conditions for succeeding in a structured course. The learner generally cannot choose his or her level of participation in, and often has little control over, the learning environment.

Mandatory (Online) Participation: The requirement that learners must engage with one or more OLEs in order to conduct a set of prescribed activities so as to satisfy the conditions for succeeding in a structured online course. It may or may not involve mandatory online interaction.

Normal (Online) Participation: Iteraction with other learners and the online platform on the learner's own terms.

Online Community of Learners: A term used to describe a group of individuals that engage with, and col-

laborate in, similar online learning activities over a set period of time.

Online Learning: The activity of seeking knowledge, skills, and training through interaction with online environments. This may or may not consist of structured activities.

Online Learning Environment (OLE): The more or less structured context that an online learner interacts with through computer-mediated communication (CMC). Usually, it is comprised primarily of (but is not limited to) facilities for synchronous and asynchronous online communication, and often includes sets of resources such as e-readings and online exercises and tests.

C

Citizen–Oriented Decision Making

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INTRODUCTION

The potential of information communication technology (ICT) opens up whole new sets of concepts and practical solutions to be developed when working with research and development (R&D) on new democratic praxis in the knowledge era (OECD, 2001; Keskinen, 2001). It is not sufficient to try to use ICT as a voting tool without first ensuring universal access to data, information, and knowledge for citizens in order for them to build their knowledge base and, second, to empower citizens to become independent decision-making collaborators. This interactive decision-making approach calls for new models that will complement, evolve, and reform the current representative democracy to better suit the modern needs of rapidly moving and changing societies (Becker, 1995; Keskinen, 1997; Becker & Slaton, 1997).

As many researchers have pointed out, the world of the 21st century is globalized (Albrow, 1997), not only in an economic sense, but also in social, political, environmental, and technical senses (Axford, 1996; Kuosa, 2001, pp. 257-269). The Internet, global media and advertising, and multinational enterprises and brands (Klein, 2001; Florida, 2002) have created a more global consciousness (Rifkin, 2001) supported by rapidly evolving ICT (Castells, 1996, 1998), and a new geographical dimension: cyberspace. Cyberspace can be seen as a complementary dimension with the more tangible social and geographical dimensions. Societies in the developed world have changed dramatically in the past 200 years, and the speed of change does not show any signs of slowing down. Should not the old-fashioned representative democracy change along with this process too (Kuosa, 2004; Keskinen et al., 2003; Keskinen, 2004)?

The new decision-making model, presented in this article, attempts to close the gap between the needs of the 19th and 21st centuries by emphasizing citizens' active role in political decision making. This model is based on legally supported participatory citizenship (Barber, 1984), as is the case in the Multiphase Referendum Method, for example. The model focuses on citizens' needs and regards citizens as collaborative decision makers. Political authorities are tied with decisions taken in legally organized deliberative procedures. Thus, this model is called the "Citizen-Oriented Model."

BASIC ASSUMPTIONS OF E-DEMOCRACY RESEARCH

The basic assumptions of the traditional representative democracy are explained in detail by Held (1987). The new models of strong and participatory democracy are extensively discussed by Barber (1984). Further, the most modern deliberative and teledemocracies are discussed and explained by Becker and Slaton (1997, 2000). Hence, we have made the following basic assumptions for research and development of the citizen-oriented democracy:

1. We assume that employing ICT for decision making can contribute to better decision-making procedures.
2. We pursue the transformational politics, which means that our aim is to change existing power structures, from stiff to dynamic, through empowering citizens.
3. We assume that the representative model is still valid, and other models are complementary to this. This does not mean that the present representative model should stay unchanged, rather, it means that different models have their proper uses for different purposes during the total decision-making life cycle. This calls for a conscious process to integrate new, participatory, and deliberative models with the representative one in a new innovative way.

THE CITIZEN-ORIENTED MODEL

The concepts of this model are described in the following section. The most important approach is that different decision-making models can be used in different stages of the decision process. This means that all the models of citizenship are not mutually exclusive, but they play different roles during the life cycle of the process, and,

furthermore, in true democratic fashion, this should also be decided by the citizens.

In the Citizen-Oriented Model, citizens are considered as decision makers with equal opportunities to representative decision makers. The vital difference to all other models is that the citizens set the agenda, not the politicians, so this process should be interactive and based on win-win strategies. However, there has to be a procedure to coordinate this process and avoid contingency/continuous need of voters input. In other words, citizens should, in many cases, be in the role of strategic decision making, and conventional decision makers in the role of executives (OECD, 2001; Becker, 1995; Keskinen, 1997).

Tools of Citizen-Oriented Model

Almost all deliberative/participatory democracy ICT tools can be used in this model as tools of any chosen phase of the decision-making process, hence it is one specific approach to e-democracy. Relevant and already used tools can be listed as follows: Internet, text messages, digital TV, local TV and radio, online debates, online polls, citizens' jury, deliberative poll, drawing lot, funnel model, e-vote, multiphase referendum. It is also clear that present state-of-the-art interactive communications methods must be further developed for facilitating genuine dialogue among parties concerned (Carson et al., 2002, 2003; Keskinen, 1999; Keskinen et al., 2001).

Examples of Successful Methods in Use

A number of successful methods have already been used throughout the world. Some of these methods can be grouped under the term "deliberative designs" because of their high levels of group interactivity, coupled with thoughtful discussion.

The citizens' jury is one example of a deliberative design and was created by Ned Crosby in the United States in the 1970s. The "jury" is typically selected using stratified sampling in order to match a profile of a given population. The participants (usually a group of 12-20) spend two to three days deliberating on a "charge" under the guidance of an impartial moderator. Participants have opportunities to question experts and to discuss the complexities of the issue and are asked to work toward a consensus response. Hundreds of citizens' juries have been conducted throughout the world since the mid-1970s, for example in the United States, United Kingdom, and Australia (Carson & Martin, 1999).

Consensus conferences have many similarities with the citizens' jury and have been conducted in Denmark since the mid-1980s. Usually a consensus conference allows more control of the "witnesses" or experts to be called and is organized under the watchful eye of a steering committee. This method often involves preparatory workshops for the participants as well as the final deliberation. Like a citizens' jury, it culminates in a written report. The Danish Board of Technology delivers the recommendations from its consensus conferences to the Danish Parliament. Consensus conferences have been conducted in many other countries, for example, Australia, Japan, South Korea, and the United Kingdom (Slaton, 1992).

Planning cells have been conducted in Germany since the mid-1970s and overcome the weakness of size that is inherent in a small "jury." Peter Dienel who first convened these planning cells typically conducts a series of simultaneous "cells," for example, 20 cells (each with 25 participants), thereby offering validity and reliability with his results (Slaton, 1992).

The deliberative poll was designed by James Fishkin and is even larger in scale. The deliberative poll is an opinion poll with a deliberative element, and Fishkin has conducted a number of these (mostly in the United States, but also in the United Kingdom, Australia, and Denmark). A phone survey is conducted, and then hundreds of respondents are invited to come together at a single location. When they gather, they deliberate on the issue and have an opportunity to work in small groups (each like a citizens' jury or planning cell), also spending time in plenary sessions when experts are questioned. At the end of the gathering (usually conducted over two to three days), participants are surveyed again. There is no pursuit toward consensus, and the responses are individual. The model has been successfully used by Ted Becker and Christa Slaton in the United States, Canada, and New Zealand (Becker & Slaton, 1981; Becker, 1981; Slaton, 1992).

A Selection of Local/Regional E-Democracy Projects and Pilots in Finland since Mid-1990s

In the following list, there are some Web sites and other sources listed concerning the various local and regional e-democracy pilots conducted in Finland. Finland is considered to be one of the most modern and advanced countries in developing the use of ICT in the world. For example, eTampere has been internationally rewarded several times for its innovative applications for e-democracy in the City of Tampere, Finland.

- **OSKU:** Citizens' information society based on local resources, OSKU—Learning Regions Project, http://www.oskut.net/english.html
- **eTampere:** Ferguson and Baron (2002), Local e-government now: A worldwide view, report of Socitm I&DeA, June 2002, Executive Summary in http://

www.socitm.gov.uk/Public/international/local+e-gov+International.htm

- **Selection of Web resources of the city of Tampere:**
    - Home page of the City of Tampere: http://www.tampere.fi/
    - Service Information System Project (Palvelutietojärjestelmäprojekti 1994-1998): http://www.tampere.fi/projekti/pati/index.htm
    - eTampere program: http://www.etampere.fi/office/fi/index.tmpl
    - WWW Service Point on Technical and Environmental Affairs: http://www.tampere.fi/ytoteto/tepa/palvelup/neuvo.htm
    - Net Café Vuoltsu: http://www.info.tampere.fi/nettikahvila/
    - Vuoltsu Activity Centre for the Young: http://www.tampere.fi/nuoriso/vuoltsu.htm
    - NettiNysse—the Internet bus: http://www.tampere.fi/kirjasto/nettinysse/index.htm
    - Access points and their locations in the city of Tampere: http://www.tampere.fi/osallistu/nettipiste/
    - Maps of Tampere: http://www.tampere.fi/ytoteto/kami/paikkat/tre/index_uk.html
- **Netti-Maunula:** http://www.kaupunginosat.net/maunula/kehittaminen/osku_engl.htm
- **KuorevESITORI:** Keskinen (1999): Towards user empowerment, on development of use of ICT in decision making of administrations, UNI Tampere (1999)
- **Learning Upper Karelia Project:** http://www.joensuu.fi/ktl/projsoc/infosoc/upperka2.htm; http://www.glocal.fi/unk
- **Espoo Youth Parliament:** Keskinen (2004): MIDEM (Models for Interactive Decision Making), EJEG, July 2004.
- **Varkaus Mobile Parliament:** Viherä and Viukari: A mobile panel to activate social capital: Case study of the town of Varkaus, in Cunningham, P., Cunningham, M. and Fatelnig, P. (Eds.), Building the Knowledge Economy. Issues, Applications, Case Studies. Bologna. JOS Press, Ohmsha.

- **Kuusamo City Customer Service:** Ferguson and Baron (Eds.), Local e-government now: A worldwide view, Report of Socitm I&DeA, June 2002, Executive Summary, from http://www.socitm.gov.uk/Public/international/local+e-gov+International.htm
- **Helsinki Virtual Village—Arabia Shore (Arabianranta) Suburb:** http://www.helsinkivirtualvillage.fi/Resource.phx/adc/inenglish.htx; http://www.wired.com/wired/archive/9.03/helsinki.html

Multiphase Referendum

As an example for new possible deliberative and citizen-oriented methods, a multiphase referendum is now outlined. This type of approach could be used in local and regional decision-making arenas. The multiphase referendum has been discussed by Auli Keskinen (1997) and is described in Table 1.

The questions arising from this construct then are: where do the citizens participate? How? Who will coordinate the processes? In the case of deliberative and direct democracy citizens will participate through all phases starting from Phase 1. In participatory democracy they will participate in Phases 2, 5 and 6, and in represenative democracy only in Phase 5.

New Technological Solutions for Better Citizens' Involvement?

For computer software development, the first and most important tasks in defining and constructing new technological solutions for better citizens' involvement can be stated as follows:

Table 1. Description of a multiphase referendum model and its phases

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7
Agenda setting: About what will the opinion poll be organized? What for? The aim: binding or advisory?	What will be asked? Background research and results are disseminated. Dialogues, discussions, learning processes, developing the alternatives needed for Phase 3	What are the alternatives for the referendum?	What are the methods used in referendum? Technical solutions, alternative tools for opinion giving?	Referendum process	Presenting and disseminating the results, public dialogues and debates	Decisions based on the results, other actions or recursion starting from Phase 1

- **Task 1:** Create tools for continually collecting and analyzing huge amounts of input information given by millions of citizens. Any kinds of answers, whether they are zeros/ones, multiple hits, etc., must be transferred into simple and understandable tables giving scientifically meaningful figures.
- **Task 2:** Create tools for genuine dialogue. Notice that dialogue means not only information and opinion transfer but also transformation and synthesis of opinions into better common opinion. In dialogue, people are ready to compromise with their opinions in a process of creating new knowledge and new innovative alternative solutions.
- **Task 3:** Create tools for the citizens to monitor decision-makers' actions to add accountability. Text messages, digital TV, etc., can be used for instance. This can include an imperative mandate by citizens, changing representatives online, or anything else. This is an area where more R&D is clearly needed.

CHALLENGES OF CITIZEN-ORIENTED MODEL

The Question of Inclusiveness

Technology development itself is thought to be useful for empowerment increase of citizens in international, national and local levels. However, there are three different kinds of deficits that need to be addressed:

1. **Participation deficit:** Our main interest at the moment is the participation deficit—but there are no legally binding reaction needs for policy makers or noninstitutional decision-making procedures in policy making (Knight & Johnson, 1994, pp. 277-296; Rubin, 2000).
2. **Legal deficit:** Present legislation supporting our current forms of representative democracy has been progressively embedded over 200 years or so, and it has very limited flexibility toward any ad-hoc processes for managing common affairs. Local politics, though, have recently been opened up to more participatory methods, but the pace is very slow when compared to the development of societies, communications facilities, and their diversity (Woolpert, 1998).
3. **Representation deficit:** The representation deficit seems to be very difficult to solve, as long as mainly "elites" participate in deliberation processes and as long as there is limited research on present frames of public spheres. There is a large need for discourse on the role of representative or deliberative process

and how to guarantee inclusiveness in decisions. The development of tools without knowing the citizens' needs is a futile task. Actually, the question of whether citizens use letters to senators or online debates on the Web becomes secondary if the deficits outlined above prevail (Becker & Slaton, 1997; Schmidt, 1993).

The Question of Process

What can be done to activate a sufficient number of citizens to participate in the decision-making process? In order to enable citizens to participate in virtual communities, three requirements are to be filled: access, competence, and motivation (Viherä & Nurmela, 2001, pp. 245-266):

1. **Access:** Citizens must have universal access to information and communications means. Problems in this area include the scarcity or low quality of ICT networking capacity, the digital divide, and other equality deficits. For example, there are many people in developed societies with high Internet connectivity who do not see any need to access ICT.
2. **Competence:** There are many people who do not possess the adequate know-how to use ICT or who do not feel that they know enough about the various subject matters to participate in the public affairs.
3. **Motivation:** Without motivation, citizens will not participate in the affairs of the commons. To be motivated, people need to feel that their opinions are heard and that they can have an impact. They should also be able to feel part of the social community in preparing and agreeing with decisions. On the other hand, the "free-rider" problem decreases the motivation. Some people think that if all is going well without their interference, why should they bother? Also, a very basic social need is human face-to-face interaction and "doing-it-together." This need cannot completely be fulfilled by ICT. In the old days, voting and political farmhouse meetings were part of leisure time and social interaction, whereas today, the participation in politics has to compete with many new forms of social and work-based interaction.

The Question of Outcome

The development of e-democracy is still at an early stage. As societies have changed with the impact of ICT, many new questions have recently emerged in the public discussion and in academic research. Relevant questions to be studied could include the following: Does e-democ-

racy as described by the citizen-oriented model result in different decisions when compared to the more traditional democratic models? How does one define "better democracy" or "better decisions"? The fundamental question is: Will democracy have a different content in the evolving information society from how we perceive democracy operating today? What can be said about ontology (ethical and political questions) of e-democracy when compared to traditional democracy (Keskinen, 2001; Held, 1987)?

FUTURE CHALLENGES

Technically, the future models of democracy are very open, as almost all the current and emerging technologies can be used for implementation of models with increased participation. The question is more a political and social one rather than a technical or operational one: what type of citizenship models do the societies want to develop and for what types of decisions? The Citizen-Oriented Model can be created in technological or political sense, but is this type of participation wanted, and by whom and for what aim? More participation in every decision is not necessarily compatible with an efficient modern state, even a democratic one. The great challenge of the future for societal decision making is how to incorporate in a democratic manner the self-organizing ad-hoc decision making with the representative official decision-making processes (Rättilä, 1999; Becker & Slaton, 1997; Woolpert, 1998).

The basic elements of the teledemocracy paradigm for the 21st century are as follows (Becker & Slaton, 2000):

- Global direct democracy movement
- 21st century democratic communications methods—horizontal and interactive
- Modern mediator movement—heterarchy and transformational politics
- Internet-based transformational political organizations

Furthermore, much more tailored ICT tools are needed to create forums for public dialogue in accordance with the new needs of the 21st century. Should democracy be about creating the forums that encompass interested and motivated citizens as well as responsible political and societal decision makers, who form today's social network working for our common issues (Keskinen, 2001)? In this sense, it is useful to consider the words of the famous democracy advocate Benjamin Barber: "We must together govern our societies ourselves; there is no one else to govern for us."

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KEY TERMS

Access: Access is one of the three preconditions for citizen participation in e-democracy (access–competence–motivation). Access to communication involves existence of technical and logical access point, communications device, and permission to access.

Citizens' Jury: The citizens' jury is a group of people selected for preparation of public opinion. The jury is typically selected using stratified sampling in order to match a profile of a given population. The participants (usually a group of 12 to 20) spend two to three days deliberating on a "charge" under the guidance of an impartial moderator. Participants have opportunities to question experts and to discuss the complexities of the issue and are asked to work toward a consensus response.

Citizen-Oriented Model: In a citizen-oriented model for e-democracy, citizens are considered to be decision makers with equal opportunities to reach representative decision makers. In this model, the citizens set the agenda,

not the politicians, or this process is interactive and based on win-win strategies. However, there has to be a procedure to coordinate this process and avoid the continuous need for voter input. The citizens should be able take part in strategic decision making, while "conventional" decision makers take the role of executive decision makers.

Competence: Competence is one of the three preconditions for citizen participation in e-democracy (access–competence–motivation). Communications competence means that a person has the ability to use channels of communication, opportunity, access, and skills to use the devices involved and to formulate messages.

Deliberative Poll, TELEVOTE: Deliberative poll or TELEVOTE is a scientific public opinion poll with a deliberative element. Generally, a phone survey is conducted, then hundreds of respondents are invited, using statistical sampling technology, to come together at a single location, or they are asked to deliberate among themselves and with other interested people and form opinions. When they gather, they deliberate on the issue and have an opportunity to work in small groups (each like a citizens' jury or planning cell), also spending time in plenary sessions when experts are questioned. At the end of the gathering (usually conducted over two to three days), participants are surveyed again. There is no movement toward consensus, and responses are individual.

E-Democracy, Teledemocracy: E-Democracy means the use of modern information and communications technologies as instruments to empower the people in a democracy to help set agendas, establish priorities, make important policies, and participate in decision making and implementation in an informed and deliberative way.

Electronic Town Meeting (ETM): In an electronic town meeting, there is discussion, deliberation among ordinary citizens, and a vote that determines the outcome.

Electronic media are used to facilitate the process. Generally, a combination of several electronic means is used: interactive TV, interactive radio, scientific deliberative polling, telephone voting, mobile phones, plus a wide variety of face-to-face meetings. The focus of the process is on problem issues or on involved planning or envisioning processes. ETM can be conducted at local, regional, or national levels.

Empowerment: Empowerment is a process of transferring power to enable people to govern their lives, not to gain power over other people or events. People are empowered when they are given the authority to make decisions in their daily work, using their own judgement to take apt actions in new situations, rather than consulting management.

Motivation: Motivation is one of the three preconditions for citizen participation in e-democracy (access–competence–motivation). The sender and recipient of communications must have a reason for sending messages and learning new skills. Human needs for self-expression, attachment, societal interaction, association, and control of one's own life are motivating reasons. In addition, to be motivated, people need to feel that their opinion is heard and can have an impact on decisions. Without motivation, citizens will not participate in the public issues.

Referendum: Referendum is a public opinion poll, where local, regional, or national authorities offer citizens the possibility to vote on a specific issue, generally on two alternatives—yes or no. The multiphase referendum uses deliberative agenda setting, feedback processes, and multiple choices.

Teledemocracy: See e-democracy.

Televote: See deliberative poll.

Civic Space Portal

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INTRODUCTION: UKRAINE, CIVIL SOCIETY AND THE INTERNET

Internet use in Ukraine has grown rapidly over the past years. In January 2001, the number of Internet users constituted 4.6% of the Ukraine's population, in January 2002—5.5%. In 2003, the number of Ukrainian e-users reached 8% of Ukrainian population or 3.8 million people (Press release, 2003). Research shows that about 2% of Ukrainian men and 2% of women have access to the Internet at home. Thirty-seven percent use Internet at work, 22% at home and 21% in Internet access sites (e.g., Internet cafes, libraries, etc.). Thirteen percent of Ukrainians residing in cities with the population of more than 500,000 inhabitants are Internet users, however in other areas of Ukraine its rate is lower—only 1%.

The commitment and involvement of civil society is equally important in creating an equitable Information Society, and in implementing ICT-related initiatives for development (WSIS, 2003). The Internet can be considered as a tool for the democratization of society, which facilitates the exercise, and protection of human rights (civil, political, social, economic and cultural rights) (Freedom of information, Transparency, eGovernment, 2004).

While using the Internet, non-governmental organizations become more effective and this has a positive influence on civil society development. According to the research conducted by the Internews-Ukraine (Internet and Civil Society of Ukraine, 2003) the Internet is used by civil society organizations to:

- Have access to information placed on Web sites of media sources, NGOs, the government;
- Receive and disseminate information (especially information related to the protection of the rights of citizens, the community and organization);
- Disseminate publications, positive experiences and news to NGOs and the public;
- Communicate and exchange experiences and establish partnerships both in Ukraine and abroad;

- Expand their activities work to a wider group of people, build networks; prepare and co-ordinate initiatives; and
- Search for financial and information support for their work.

UKRAINIAN NGOs AND THE CIVIC PORTAL

Notwithstanding the need for a broader presence in the Internet medium, to date, the majority of Ukrainian NGO-related resources are visited at a rate of less than 50 visitors per day, which is insufficient to play an influential "electronic" role. These figures are also extremely low compared to commercial resources rates. Due to the lack of IT specialists, NGO Web sites in Ukraine are not regularly updated and contain limited information on the projects and initiatives implemented by represented NGOs. Such resources may serve as a platform for closer acquaintance with the NGO, but cannot be a primary source for prompt use of information by partner organization, media, or local government. At the same time, electronic communication between Ukrainian NGOs was limited to the use of mailing lists released irregularly.

The concept of the NGO portal has emerged as a reaction to numerous requests expressed by Ukrainian NGOs to design a complete online toolkit that would: generate reference, information and resource data; facilitate e-access and systematize data required for the development of the civil society in Ukraine; provide technical support; and, spread information on NGO activities to the public.

In March 2001, the International Renaissance Foundation (IRF, 2004) supported the project to establish the Civic Internet Portal. Subsequently, the Portal was supported by the United Nations Development Program (UNDP, 2004). Summer 2002 was marked as the first online release of the Portal that delivered news service to Ukrainian NGOs. In 2003, based on survey results and a series

of trainings "Efficient NGOs Through ICT Use" covering 10 regions, the spectrum of online services has greatly expanded and the Portal was titled as the Civic Space Portal (2004). Currently, the IRF's Information Program administers the project.

Portal Goal and Tasks

The goal of the Civic Space Portal is to:

- Provide the third sector with the ICT kit to enhance the professional capacity of Ukrainian NGOs and improve their efficient networking;
- Systematize and archive available resources and reference information on the third sector in Ukraine and within the region; and
- Disseminate information on the third sector to media, government, and public—at the regional, national and trans-border levels.

Portal Products and Services

The Civic Space Portal provides a series of services and products:

- **News Line and Events Calendar:** daily inform on the third sector news within Ukraine and in the region;
- **Web catalogue of Ukrainian NGOs:** regional and international donor agencies, information and fundraising services, resource centers that may be of interest to NGOs;
- **Online Forum and Poll:** online opinion of Internet users on pressing issues of the third sector;
- **E-Library of the Third Sector:** electronic publications and announcement of editions online—from NGOs and for NGOs;
- **Online Consultant:** documents and reference sources and finance and law for Ukrainian NGOs, enabling NGO users to post questions and get prompt qualified answers;
- **Project Marketplace:** simplified mechanism on submission of project proposals from Ukrainian NGOs to a pool of donor agencies;
- **Jobs Exchange:** updates on new vacancies and resumes for NGO representatives;
- **E-Mailing** of news, announcements, and posts by third-sector players, scholarships and grants, trainings and Portal updates.

NGOs may also get use of such technological services as:

- **News Export** to Web sites of NGOs;
- **Web-Mail** for NGOs;
- **Text Version** for NGOs that experience slow Internet access;
- **E-Mail List** administration for users that do not have opportunity to support their Internet resources; and
- **Web-Hosting** for Ukrainian NGOs.

Among consumers of Portal services and information are NGOs in 25 regions of Ukraine, regional communities, resource centers, think tanks, local and international donor agencies, social services, central and regional government authorities, mass media, press centers of political parties, Ukrainian citizens.

VISION OF SUCCESS

The Interlinkage of Services and Products

Currently, the Civic Space Portal offers a wide spectrum of information, advisory and technological products and services for the third sector based on advanced customer-oriented ICT.

Interactivity Mode

Resource is characterized by simplicity of posting (presenting) information and commenting on posts of others by online users. Organizations or a group of organizations may discuss the problems of practical interest in the Forum, rate E-library incomings, or join interactive events, initiated by the Portal together with partner organizations.

User-Friendliness

Search option and categorization enables easy navigation through over 3,000 news and events (both fresh and archived) in the *Newsline* and *Events Calendar*, nearly 500 resources by 48 categories in the *Web catalogue,* 300 documents by 81 categories in *E-library*; as well as over 100 documents on finance and law in the *Online Consultant*. Users may search by the time of publication, source, region, subject, or using other parameters.

Technological Support of Users

The Portal team provides over 200 representatives of NGOs with Web-mail e-mail accounts for NGOs (Web-Mail, 2004), whereas 40 NGOs use Web-hosting on a free basis (Hosting, 2004). Also, NGOs that experience slow e-traffic may use text version delivered by the Portal (Text only, 2004).

C

Non-Biased Approach

Information policy of the Portal is based on the principles of interactivity, non-biased approach, promptness and content completeness. The Portal welcomes the wide array of opinions and offer different, quite often controversial opinions.

Staying apart from interests of specific NGOs or civil movements, the Civic Space portal offers each NGO from any region of Ukraine the platform to publicize its gains or release corporate information, voice its opinion, provided that such information is in line with the Ukrainian law, general ethic standards, and placed in Ukrainian, Russian, or English.

Unique Products

The Portal delivers an array of services innovative for third sector of Ukraine and the region. Specifically,

*   Project Marketplace enables NGOs, no mater how distant they are, using online forms, to register project proposals online, and a group of interested donor agencies—to identify their support of the initiative under program priorities. The Project Marketplace mechanism enables users to avoid situations where virtually similar project proposals submitted by one NGO to different donor agencies may receive cross-funding. It is noteworthy to note that the service provided its efficiency during the Joint Project Pre-Election Initiative organized by a group of donor agencies on the eve of presidential election 2004.
*   Job Exchange enables users to post vacancy/resume online and receive prompt calls or e-mails from interested organizations practically overnight through electronic mail updates distributed among 1,500 Portal users.
*   Interactive Events aim to disseminate information on initiatives and actions of NGOs, especially donor agencies. In January 2003, the Portal teamed with the IRF and the representative office of the European Commission to conduct the Information Week Online (EU Programs for Ukrainian NGOs, 2004), visited by a high number of online visitors, reaching 1,000.
*   Internet support of public discussions initiated by civil society organizations. From January 2003 through February 2004, the Portal provided online platform for public discussions of the Law of Ukraine On Social Services and a group of NGO-related legal acts. The Parliament's Civic Board on Legislation on NGOs and Regional Development, the World Bank-administered Dialogue for Reforms Projects, and other civil institutions led those discussions. In

April 2004, the Portal delivered the platform to the International Center for Prospective Studies (ICPS, 2004) on the initiation of public hearings such as "Reforming the Benefits System in Ukraine," "Improving the Business Environment in Ukraine," as well as others.

*   Online Polls of public opinion enable promptly and without attracting additional funding identify major trends and spectrums of public opinion on pressing issues, using Internet. Online poll conducted from April 29 through May 12, 2004 by the Portal's team together with the Democratic Initiatives think tank (DIF, 2004) aimed to identify the public opinion on controversional regional elections in Trans-Carpathian town of Mukachevo.

Currently, leading national Internet rating systems (BigMir, 2004; Topping, 2004) rate the Civic Space Portal as the most visited online resource among hundreds of other national non-governmental organizations presented online. Such a high rating is the result of the work done by the Portal, its technical and content groups that work in the team with other NGOs, on building e-civil society in Ukraine.

CONCLUSION

Community development is one of the key elements behind the emergence of Ukraine as a democratic nation. Its prospects are closely related to e-access and possibilities to enhance the social impact of the NGOs in Ukraine. The Internet, along with other informational and communication technologies, provides great advantages to expand the impact of the civil society organizations and enhance NGO networking. The Civic Space Portal plays the role of information and technological facility to improve e-presence and catalyze the influence of the third sector within Ukraine.

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KEY TERMS

Civil Society Organizations: All civic organizations, associations and networks which occupy the "Social space" between the family and the State who come together to advocate their common interests through collective action. It includes volunteer and charity groups, parents and teachers associations, senior citizens groups, sports clubs, arts and culture groups, faith-based groups, workers clubs and trade unions, non-profit think-tanks and "issue-based" activist groups.

Content: An amount of well-presented subject information in text, graphics or multi-media formats (portals, Web sites, e-mailings, news lines, etc.) built around a specific structure, based on established information standards, and targeted on a specific online audience.

Content Management Systems (CMS): A system used to collect, manage, and publish the content of a Web site, storing the content either as components or as whole documents, while maintaining the links between components.

Information Product: A specific audience-targeted content combined with the accompanying service. Different information products may base on the same service. As an example, products "Regional News" and "Press Conferences Announcements" may base on one service such as "Newsline." Additional services (i.e., search, e-mail lists) may serve to support each information product that owns its own marketing strategy and development standards. Consideration of user needs, requests and possibilities are they key to establishing quality information products.

Nongovernmental Organization (NGO): A nonprofit organization, which is not fully funded or controlled by government and which is promoting human well–being on a not-for-profit basis. The organization should have a legally established constitution, a clear purpose and visible activities with a governing body, which has the authority to speak for its members.

Platform: Specific computer hardware or a specific combination of hardware and operating system. It is also used to refer to support software for a particular activity, as in "This program provides a platform for research into routing protocols."

Portal: An Internet resource that integrates information and services on a wide spectrum of topics (*horizontal portals*) or on specialized subjects (*vertical portals*). A portal plays the role of a gateway to different sources of information on the Internet. Together with the content, portals integrate technological services—Web-mail, chats, forums, personal Web pages, etc.

Service: A technological component of an Internet system, Web site or other information system that plays a specific role relevant to content. It may include publication of posts, search, poll conducts, forum management, etc. Traditionally, service uses one type of information and has typical functions.

Third Sector: A generic collective name for charity, voluntary, community and non-government organizations. Third sector refers to a set of civic and social organizations or institutions situated between the State (first sector) and the business world (second sector).

Civil Society and the New Economy

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INTRODUCTION

Is Civil Society Ready for the New Economy?

During 1990s, the transformations that took place in the world economy, focused mainly on information and communication technology (ICT), were expected to mark the beginning of an era in which recessions would only be a memory of the past. This transformation principally driven by the capacity of ICT was called the new economy (NE). At the early stages of the 21st century, it is increasingly evident that the NE did not accomplish all the marvels that were expected from it. However, Stiglitz (2003) stated that even if it was the basis for a short-term boom and for a recession that overcame even the postwar period rate, the basis for the NE is real. The Internet, technological advances, and the new ways to produce and make business are genuine. "If the 18th and 19th Centuries marked the passage from agricultural economy to the industrial economy, and most of the 20th Century witnessed the change from an industry-based economy to a services-based economy, the last decade of the 20th Century signaled the change to a weightless economy, the knowledge economy" (Stiglitz, 2003, p. 228). In such a situation, information management (Talero & Gaudette, 1996) becomes a window to opportunity.

Many developed countries, and a few emerging countries, such as Brazil, India, China, and South Africa, have adopted national strategies aimed at increasing the innovative capacity of their industries. As Gurstein stated:

Among the common elements of these strategies is a focus on scientific research and development, the training of highly qualified personnel, the creation of an environment of incentives to support the creation and growth of knowledge/research intensive enterprises, the re-orientation of the educational systems towards science and mathematics and the creation of an element of the national culture which is supportive of these areas and so on. (Gurstein, 2003, p. 3)

He is firm on the principle that the real opportunity for innovation and for having major impacts as a result of an innovation strategy is in enabling the development of a leap-frogging capacity directly into a knowledge-based economy from a more traditional economic base. *This then begs the question of what could be the relationships between civil society and the new economy that is understood to be a part of the development process both in the developed and the developing countries?* Is civil society ready to be a proactive agent in this process? What specific lines of action should be undertaken by civil society to enable the integration into the new economy to become a motor for development, as well as to diminish its negative impacts on fragile economies, and on vulnerable social groups? The impact of civil society on this process will depend largely on citizen's e-readiness. *Citizen e-readiness describes the readiness of a nation's citizens to make purposeful use of Internet technologies* (IAP, 2002); it covers many facets in such use, but particularly, equality of access opportunities, training, knowledge, and social appropriation of ICT. Specifically, in the environment of the NE, citizen e-readiness also defines the ability of individuals, communities, and civil society to participate as proactive agents in the different sectors and levels of the NE.

THE CONTEXT

Dimensions of the New Economy

According to Joseph Stiglitz (2003), the NE has meant a vital change in displacement from the production of goods to the production of ideas, which supports the treatment, not of staff or stocks, but of information. IAP (2002,) defines the NE as "…the dynamic system of interactions between a nation's citizens, the business and government that capitalize upon technology to achieve a social or economic good" (p. 4). IAP assesses three major stakeholder groups: citizens, business, and government. However, in my view, a fourth important actor is a determining factor in the NE: the science and technology sector, without which technological innovation and knowledge would not exist or evolve.

The Wired's *Encyclopedia of New Economy* (2004) adds other viewpoints: "When we talk about the new economy, we're talking about a world in which people work with their brains instead of their hands. (…) A world in which innovation is more important than mass production. A world in which investment buys new concepts

or the means to create them, rather than new machines. A world in which rapid change is a constant. A world at least as different from what came before it as the industrial age was from its agricultural predecessor." Kelly (1997) prefers the term "network economy," because *information* is not enough to explain the discontinuities we are witnessing. This author suggests that an ever-increasing volume of information was produced in the 19th and the 20th centuries, and that many knowledge enterprises have been built on information capital, but only in the 1990s was there a total reconfiguration of information that shifted the whole economy.

Finally, Castells (2000), summarized by Obendorf (2000), stated that the new economy is not based just on knowledge. It has three key features, all of which are based in microtechnology:

- Information productivity, based on ICT;
- Real-time: global connectivity of capital flows, productivity, and management, which is only possible due to the technology infrastructure (the Internet);
- Networking: it is based on the Internet, which is more than just a technology, it is the basis for social and economic organization.

The new economy forces civil society organizations to face new risks, challenges, and rewards, as explained in the following points.

The Challenges

Castells, in Obendorf (2000), pointed out a number of new challenges imposed by the NE, including:

- The truism that winners entails losers—the move away from traditional employment patterns brings with it a disassociation from work, of social protections provided by welfare, insurance, etc.
- An increase in multicultural societies and decrease in homogeneous societies. National and transnational migrations augment following work opportunities.
- Innovative education: the NE drives a need for new forms of education, based on information research, and for processing this into knowledge.
- Inclusion of all the regions in the world, not just of the developed countries or the most developed regions in emerging countries.

The Risks

ICT can and should play a key role in social and economic development in developing countries (DC), but under the current circumstances of globalization, it is a

reduced role in many cases. Castells (2000b) stated that, because present information capacity is concentrated in certain countries and social sectors within countries, educational inequality is translated into social exclusion. *Information capacity is not limited to connectivity and adequate education, which should be extended through reinforcement of the information society paradigm: the production of knowledge is applied in technological innovation, which, in turn, facilitates the creation of new knowledge* (Tapper, 2004).

Obviously, there is a need for civil society to connect its technological capabilities and societal ethics in meeting the challenges and demands of the NE that influence our lives, economically, socially, culturally, and politically. We will first analyze the impacts of the NE on citizens (Finquelievich, 2003):

- ICT contributes to the economic development of nations but also tends to deepen inequalities; the impact on the economies of the developing countries will be different than that experienced in the economies of the developed countries.
- ICT impacts new labor flexibility, and hence, new labor insecurity, particularly in developing countries. There are several reasons for this:
  1. The initial innovators—in many cases, U.S.-owned companies—are the ones that benefit most.
  2. ICT infrastructure is more profitable and easier to develop in urban areas, which accentuates inequalities with regard to regional and rural areas.
  3. ICT-related employment requires specialized labor and is managed through flexible labor policies. Unlike developed countries, most developing countries do not have social security systems backed by adequate and structured public policies that help mitigate the effects of the transition from the economy of the industrial society and that of the knowledge society (Proenza, 2002).
  4. As Castells (2002a) pointed out, winners imply losers, and the move away from traditional employment patterns also implies social unprotection.
- The increases in multicultural societies, as well as labor flexibility, which are frequently linked to employment changes, imply the need for adaptability to fast cultural and geographic changes.
- The NE urges a need for more innovative education, but not all the citizens can afford to send their children to innovative educational institutions, which are often privately run. As a result, an aggra-

vation of the educational gap emerges, which, in turn, influences labor opportunities.

- There is a need to advance beyond connectivity. In order for ICT to have positive impacts on development, it must be clearly understood that connectivity is not an end in itself. It is but a tool that can help create concrete solutions to the problems and needs of the people. To develop and redistribute the wealth of the so-called NE, it is necessary for civil society to have some control over it. Reinforcement of the capacities in civil society to appropriate and produce these technologies is also needed.

- Gender inequalities are present. Although women represent a growing proportion of Internet users, they are underrepresented among engineers, technicians, managers, and entrepreneurs in the emerging information society. Access to and basic technical uses of ICT are not sufficient indicators to encourage women's participation in the new economy. What determines the role that women play in the NE is how they use the Internet for local and individual benefit and the knowledge and technical training they use to prepare themselves for the NE.

- There are insufficient infrastructures. Communication infrastructures are generally provided to densely populated areas or in high- and middle-income areas, where telecommunication support enterprises can obtain substantial profits. Therefore, the populations of remote, lowly populated, or low-income areas are often deprived of adequate ICT infrastructure.

The Opportunities

The new economy is based on managerial, technological, social, and political innovation. Hence, it brings new risks for social inclusion, but it also implies new challenges and opportunities for citizens and an organized civil society sector, in the pursuit of useful development. Development opportunities impacted by the interface between ICT, civil society, and development include the following:

- The ability to participate in the generation of local and regional innovation environments becomes present. This was defined by Castells and Hall (1994) as systems of social, institutional, organizational, economic, and territorial structures that create the conditions for the continuous generation of synergies, and their investment in a production process generated by this synergic capacity. The development of the means for these types of innovation environments is decisive for local and regional economic development.

- The possibility of economic and technological "leap-frogging" is present. Such "leap-frogging" is increased because of the widespread opportunity for acquiring a state-of-the-art ICT infrastructure similar to the infrastructure (and often cheaper and more effective) that enables industrial innovation in more advanced countries and economies. In this case, the introduction of a state-of-the-art ICT infrastructure presents developing economies with opportunities for the development of national innovative capacities equivalent in this respect with those that exist in its much more advanced competitors (Gurstein, 2003), i.e., development of software industries in Brazil, China, and India.

- There is an increasing mobility of individuals as students or faculty or researchers, as well as North–South or South–South cooperation agreements. This implies that many developing countries may have access to highly qualified national professionals who can provide some of the human capital necessary to support innovation for NE initiatives at the national level (Gurstein, 2003).

- The links between the various educational sectors are increased. This includes training and research nongovernmental organizations (NGOs), and enterprises, in order to enlarge local and regional IT capacity for enterprises. Increasing IT competence in local industry may derive in higher capacity to compete not only in a local market place, but also nationally and internationally, hence offering more job opportunities.

- Communities are assisted in developing ICT- based initiatives for local development and income generation, e.g., computerized records of land ownership; linking of cooperatives, farms, or small businesses through ICT networks; supply of information, products, and services required in local production, etc.

CITIZENS' E-READINESS

To gear up for the challenges and opportunities of the network economy, action is required from governments, the private sector, as well as from international investors. Such action will also require the involvement of civil society, because the new world of knowledge calls for new kinds of social contracts (Lanvin, 2002). In order to benefit from such opportunities, countries and citizens need to be prepared for these economic, social, cultural, and technological transformations impacting their physical environment (Bridges, 2001). *Citizen e-readiness describes the readiness of a nation's citi-*

zens to participate as proactive agents in the different sectors and levels of the NE, and to capitalize on the opportunities to participate offered by the new economic and technological environment (IAP, 2000).

Citizens' e-readiness requires:

- Access to ICT adequate infrastructure.
- Broad-based training in ICT use (not only ICT literacy, but the means of managing enterprises using ICT benefits).
- Fast and low-cost access to Internet connections
- Information and social awareness of the benefits of participating in the new economic environment.
- Social awareness and creativity to identify the niches of opportunity offered by the NE.
- Access to public information about state and private-sector initiatives in the NE field.
- Willpower, information, and social organization to pressure the governments for the required ICT infrastructure, innovative education, legislation, and public information.
- Information and organization to denunciate the negative affects of the NE on society, and the coordinated ability to negotiate with the public and private sectors for the delivery of the necessary measures to eliminate or diminish these impacts.
- Effective use of ICT: According to Gurstein (2003), "effective use" may be defined as: The capacity and opportunity to successfully integrate ICT into the accomplishment of self or collaboratively identified goals."

THE NEAR FUTURE: POSSIBLE ACTION LINES FOR CIVIL SOCIETY IN THE NEW ECONOMY

The present tendencies suggest that civil society organizations (CSO) will have proactive roles within the NE. In order to connect ICT for its mission of poverty alleviation and sustainable economic development, civil society must address the following objectives at national and regional levels:

- Understanding of the full scope of the NE for local development, and disseminating this knowledge among citizens and CSO.
- Identification of appropriate priorities: Information systems with the catalytic capacity to enhance national and regional economy activities should be considered as strategic and as part of the national information infrastructure. This includes sector-wide information systems for education, financial management, enterprises management, imports and exports, laws and regulations, e-commerce, communication, and transportation.
- Encouraging multisectorial synergy: This requires the achievement of constructive alliances among and between the public and private sectors, civil society, the academic sector, and the many relevant international cooperation institutions. This is essential to achieve the necessary implementation of actions for the promotion of social and economic development through the use of ICT.
- Delivering educational systems adapted to information society's needs: Most of the educational plans and projects around the adoption of ICT are concentrated in primary education. Generally, there is insufficient effort aimed at stimulating higher education study of the information society or creating new educational degrees to train professionals for generating the appropriate knowledge (Finquelievich, 2003). Moreover, to enter into the information society on solid footing, the educational system must train researchers who can produce knowledge for the science and technology sector, which then invests the knowledge produced back in the educational system.
- Participating in the public and private sectors' decisions on the systemic improvement in the functioning and competitiveness of key sectors of the national and regional[1] economy through strategic policies and implementation plans.
- Identifying and disseminating new ways to use ICT in solving the prevailing local and regional problems of social and economic development, including education, health, urban and rural development, environmental awareness, and job creation (Finquelievich, 2003).
- Identifying and promoting new ways to use ICT in solving the most widespread social and economic problems in developing countries, in order to diminish the negative impacts of the NE on fragile economies and on vulnerable social groups.

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KEY TERMS

Civil Society: There are many definitions of the term "civil society," none of which receives universal acquiescence. "At its simplest, civil society is the arena in which people come together to pursue the interests they hold in common—not for profit or the exercise of political power, but because they care enough about something to take collective action. In this sense, all organizations and associations between family and state are part of civil society, except firms: religious and professional organizations, labor unions, the media, grassroots associations, NGOs of different kinds, and many others." (World Bank Group, Consultations with Civil Society Organizations (CSOs): General Guidelines for World Bank Staff, 2004, *http://www.worldbank.org/participation/cas/CASCSO.htm*, originally by Michael Edwards, *http://www.worldbank.org/poverty/scapital/library/edwards.pdf*). There are many ways one could classify the different organizations of civil society—by sector, focus, origins, scale, level of formality, values base, and different theoretical perspectives. As with definitions, there is no universally accepted schema, and the details of each typology should always be adapted to reflect the needs of particular tasks.

E-Readiness: The capacity to participate in the global digital economy. "An 'e-ready' community has high-speed access in a competitive market; with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are "favorable to promoting connectedness and use of the Network." (Bridges.org, Comparison of E-Readiness Assessment Models, Final draft, v. 2.13, 14 March 2001, *http://www.bridges.org/ereadiness/tools.html*).

Education: The ability to train yourself. Training—acquiring the skills necessary to do a specific job—is the

most important form of investment in an information economy. Education allows people to manage their own ability to acquire and use knowledge, and, thus, to manage their own careers and lives. (*WIRED*, Encyclopedia of the New Economy, 2004, *http://hotwired.wired.com/special/ene/index.html?nav=part_two&word =education*).

Information: According to the World Bank, "Information is a factor of production, in a category with land, labor, capital, and energy" (Harnessing Information for Development—*A Proposal for a World Bank Group Strategy*, *http://www.worldbank.org/html/fpd/harnessing/definitions.html*).

Information System: An information system provides a societal capability based on the use of information that takes in its full context of people, institutions, policies, processes, incentives, data, information technology, and infrastructure (Harnessing Information for Development—*A Proposal for a World Bank Group Strategy*, *http://www.worldbank.org/html/fpd/harnessing/definitions.html*).

Information Technology: According to the World Bank, it consists of hardware, software, and media for collection, storage, processing, transmission, and presentation of information.

Innovation: The term "innovation" designates both a process and its result [Green Paper on Innovation, European Commission, 1996, COM(95) 688]. It involves the transformation of an idea into a marketable product or service, a new or improved manufacturing or distribution process, or a new method of social service.

The term also encompasses social, institutional, and organizational innovation, including in the services sector. The concept of innovation is also used in connection with the analysis of processes of technological change. Traditionally, technological change was viewed as consisting of three stages: invention, innovation, and diffusion. Innovations can take place at any time in all areas of the economy.

New Economy: "… an information economy is more open—it doesn't take a production line to compete, just a good idea. But it's also more competitive. Information is easy not just to duplicate, but to replicate. (…). The average size of companies shrinks. New products and knockoffs alike emerge in months rather than years, and market power is increasingly based on making sense of an overabundance of ideas rather than rationing scarce material goods. Each added connection to a network's pool of knowledge multiplies the value of the whole—one reason for Microsoft's astonishing growth. The result: new rules of competition, new sorts of organization, new challenges for management" (*WIRED*, Encyclopedia of the New Economy, 2004, *http://hotwired.wired.com/special/ene/index.html?word=intro_one*).

ENDNOTE

[1] By Regional, we understand geographic and/or political macro-regions, such as MERCOSUR in Latin America.

Clustering Dynamics of the ICT Sector in South Africa

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INTRODUCTION

Both the production and use of ICT are unevenly distributed across countries and regions. While this is typical of emerging and fast evolving technologies, there are particularly significant spatial differences in the patterns of ICT production. Traditional explanations for these differences include distinct factor endowments, technologies and policies. Regions with originally similar characteristics may develop in very different directions. Hence, the *locational patterns* of ICT cannot be explained in terms of factor endowments and policy regimes only (Barrow, 2001).

The tendency of knowledge-driven industries in particular (such as the ICT sector) to cluster geographically has been recognised in policy-making (Lall, Shalizi, & Deichmann, 2004). Proximity to university laboratories and other research centres provides ICT-related firms located in innovative clusters with easier access to scientific expertise and research results, thus, facilitating transfer of research into commercial applications (Acs, Audretsch, & Feldman, 1992, 1994; Jaffe, 1989). Furthermore, firms located in a science park benefit from agglomeration economies, due to the fact that numerous high technology enterprises are clustered in a relatively small area, especially if they operate in the same sector, or in closely connected sectors (Palmai, 2004). The networking opportunities of tenant firms are also widened, basically for the same reason. Finally, the park acts as a bridging institution providing tenant firms with suitable accommodation on flexible terms and technical and business services which are particularly valuable to new high-growth enterprises (Durao, Sarmento, Varela, & Maltez, 2004).

This article looks at the clustering dynamics of the ICT sector in South Africa. The article focuses on two regional (i.e. Western Cape and Gauteng Provinces) ICT cluster case studies which illustrate a clear and intensifying concentration tendency of ICT-related production and R&D, viz. the Bandwidth Barn (a flagship project of the Cape IT Initiative [CITI]) and the Innovation Hub (a component of the Blue IQ project). Finally, the author draws a number of generalisable issues from the case studies which have wider applicability for developing countries.

THE INNOVATION HUB

In March 2001, in a bold bid to position Gauteng (which is South Africa's wealthiest province) as South Africa's "Smart Province", the Gauteng Provincial Government launched an initiative called Blue IQ. The Innovation Hub is part of the Gauteng Government's ZAR 1.7 billion Blue IQ project, under the auspices of the Strategic Economic Infrastructure Investment Programme (SEIIP). Blue IQ is Gauteng Province's high-tech industrial promotion agency. The Innovation Hub's vision is to "create a unique space where high-tech entrepreneurs, businesses, education, research and venture capital can meet, network and prosper" (Innovation Hub, 2003, n.p.). The 11 Blue IQ projects focused on three sectors:

- **Smart industries:** i.e., the Innovation Hub and Gautrain Rapid Rail Link;
- **High value-added manufacturing:** i.e., Gauteng Automotive Cluster; Wadeville Alrode Industrial Corridor; Johannesburg International Airport (JIA) Freezone; and City Deep Terminal; and
- **Tourism:** i.e., Cradle of Humankind World Heritage Site; Constitution Hill; Newtown; Dinokeng; and Kliptown.

The Blue IQ initiative aimed to: (1) create an environment in which smart industries in the ICT and bio-medical sectors can thrive; (2) shift Gauteng's manufacturing sector away from traditional heavy industry into more sophisticated, high value-added production; and (3) develop business tourism in order to capitalise on Gauteng's status as South Africa's commercial and financial hub.

The Innovation Hub became a full member of the International Association of Science Parks (IASP); the only full member in Africa. Furthermore, the Business Incubator at the Hub became a member of the National Business Incubators Association (NBIA) in the United States, which seeks to provide professionals worldwide with information, education, advocacy and networking resources for early-stage companies. The Innovation Hub consists of:

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- A high-tech incubator;
- An entrepreneur/innovator development programme, including Coach Lab where postgraduate students are mentored to work on industry projects;
- Initiatives targeting empowerment; and
- Alliances with world-class academic and research institutions.

The Innovation Hub was developed to:

- Establish a high-tech hub in Gauteng;
- Develop infrastructure to implement and stimulate high-tech business in a conducive and mutually beneficial environment; and
- House other essential components such as incubators, venture capital funders and professional service suppliers, to form the basis for a world-class 'innovation corridor' in the province.

The Innovation Hub was South Africa's first science park and a joint initiative between the Gauteng provincial government and the Southern Education and Research Alliance (SERA), an alliance between the University of Pretoria and the Council for Scientific and Industrial Research (CSIR). Construction started in October 2003 (and is expected to be finished in late 2004/early 2005) with the objective of creating South Africa's own 'Silicon Valley'. The ZAR 300 million Hub, located in Pretoria, was being built around the concept of technological convergence. The sectors that were being targeted include biosciences and biotechnology, ICT, electronics, aerospace, advanced materials, and advanced manufacturing sectors such as automotive, defence and defence spin-offs. The Hub was positioned adjacent to the University of Pretoria and directly to the east of the Hub-just across the N1 highway-lies the CSIR. Hence the Innovation Hub, situated on a "knowledge axis", was therefore deemed to be at the centre of knowledge and information. Pretoria is only 60km by freeway from South Africa's commercial capital, Johannesburg. Furthermore, the Gautrain Rapid Rail Link, another Blue IQ project, is set to link Pretoria, Johannesburg and Johannesburg International Airport by 2006.

The provincial government saw the hub as: (1) creating a unique location in Gauteng Province where high-tech industry, academia and entrepreneurs will be able to meet and work together; (2) better positioning the province as a globally-competitive knowledge economy; (3) a catalyst to enhance the innovative and growth capacity of high-tech companies and to improve productivity and technology; 4) an incubator for high-tech start-ups; and

(5) promoting black economic empowerment by acting as an incubator for innovative black start-up companies.

Processes and outputs of the Innovation Hub are benchmarked on a continual basis, against international best practice. The objectives of the incubator are:

- To facilitate the accelerated growth and sustainable development of technologically innovative start-up companies;
- To position the Innovation Hub incubator as the prime location for technologically innovative start-up companies; and
- To be a leader in South African best practice incubation.

Facilities and services offered by the incubator include:

- Flexible leases and a variety of office sizes;
- Reception and secretarial support;
- Sophisticated ICT infrastructure for the guaranteed supply of unlimited connectivity and high bandwidth;
- Management advisory and mentoring services, including structured training programmes focused at the developmental needs of the new venture;
- Business support services (financial, legal, administrative);
- Access to business networks and markets;
- Assistance in finding suitable black economic empowerment partners;
- Assistance with obtaining venture capital or financing;
- Assistance in accessing technical expertise;
- Entrepreneurship development and education;
- Participation in a high-tech cluster with access to like-minded people, i.e., being part of an entrepreneurial, innovative community;
- Being part of an established brand, *viz*: the Innovation Hub;
- Market visibility by means of corporate advertising (marketing support);
- A research interface; and
- Technological support.

The incubation programme is made up of three phases: (1) *pre-incubation phase* which was designed to last for about six months and to make sure that the start-up had a good business plan and tested the market with its product; (2) the *incubation phase* designed to last for between three to four years; and (3) the *associate stage* was designed as the final phase of the programme, as a

year-long "after care" stage. The incubation programme produced early success stories such as Expertron, a start-up which invented a new information security solution product. Expertron concluded a 30% shareholding deal with Grintek early in the process, and was granted a lucrative contract for the product by the ERP.com group. Another start-up Naledi3d Factory, successfully established an interactive virtual reality development facility in Uganda.

THE BANDWIDTH BARN

The Bandwidth Barn was the pioneer project of the Cape Information Technology Initiative (CITI), a not-for-profit promotion agency for the ICT industry in the Western Cape. The Cape IT Initiative (CITI) was established as a non-profit public-private partnership funded by the Western Cape Province and City of Cape Town governments, as well as more than 40 corporate members including UUNET, Microsoft, Telkom and other national, regional and local businesses. CITI aimed to promote the development of the Knowledge Economy in the Western Cape Province of South Africa and to act as the marketing agency for the Western Cape ICT sector. CITI's intention is to grow the Western Cape into an international ICT hub, creating jobs and building the regional economy. The Bandwidth Barn offers entrepreneurs the facilities, bandwidth, mentorship, support and networking required to grow young businesses and foster innovation. The overall aim of the Bandwidth Barn is to facilitate the creation of jobs (social goal) and wealth (economic goal) through ICT, and to make the region more attractive for direct foreign investment (economic goal).

The Barn was financed by a million Rand sponsorship from the Department of Trade and Industry's Sector Partnership Fund (SPF) and it received a multi-million Rand sponsorship from UUNET SA, the largest carrier of Internet traffic in Africa. The Barn is located in Cape Town's central business district, in close proximity to three major universities, i.e., University of Cape Town, Stellenbosch University and the University of the Western Cape-all of which graduate computer engineers. The objectives of the Barn are to:

- Serve as a focus point for ICT entrepreneurship in the Western Cape and to bring the benefits of 'clustering' to the budding ICT sector in Cape Town;
- Provide fast 24/7 Internet connectivity (ADSL) to high-tech start-ups;
- Provide small ICT businesses with affordable office rentals, shared office facilities to reduce overhead costs for services like Internet connectivity, telephone and reception;

- Provide incubation for start-up ICT entrepreneurs in the Western Cape;
- Provide a supportive networked community to create synergies; and
- Create a network of strongly interdependent firms and specialised suppliers, knowledge producing agents (education institutions, research bodies, engineering companies), bridging institutions (brokers, consultants) and customers, and to link together in a value-adding production chain.

The Barn is a unique incubation model where the stability of anchor tenants is coupled with a dynamic and evolving set of small companies. The Barn aims to remove the barriers that impede small start-ups, i.e.:

- The cost of high quality Internet access;
- The difficulty of finding premises and the requirement to sign long-term leases;
- The cost of reception and PBX services; and
- The isolation of operating on one's own.

One Barn success story is the black empowerment company, *Liquid Thought*, which is an e-business consulting service. The company is three years old, employs 10 people and its turnover is likely to exceed ZAR 10 million by the end of the 2003 financial year. Zulfiq Isaacs, the MD of Liquid Thought, had this to say:

The Barn was critical to our success. Clustering enables you to reduce overheads by sharing the cost of Internet access and other infrastructure, it quickly raised our profile in the marketplace and created networking opportunities. Most importantly, we were able to partner other companies with different skills to create joint projects. (CITI, 2003, n.p.)

CITI has formed the "Cape Lab" initiative to help teach entrepreneurs about international markets and to forge links with peer organisations like *Enterprise Island* in the UK and *Enterprise Ireland* in the Republic of Ireland to help address this issue. CITI envisions the Western Cape duplicating India's success in attracting offshore software development projects and international software support centres. Further, the Bandwidth Barn has been actively involved in local and provincial ICT initiatives (e.g. the Cape Online e-Government Strategy) and in policy-making organisations such as the Internet Service Providers Association (ISPA), the Internet Society of South Africa (ISOC SA), ICANN, etc.

DISCUSSION

The geographical structure of the Bandwidth Barn and the Innovation Hub are concentrated, with a multitude of linkages between core firms, their spin-offs and local subcontractors, world-class universities and research centres, and local/regional authorities. Some key common features characterising this specific production model can be identified, namely:

- The geographical proximity of small and medium sized firms;
- A spatial development where the interface of research with commerce and industry is encouraged for the better exploitation of technology;
- A dense network of inter-firm relationships, in which the firms cooperate and compete at the same time;
- A dense network of social relationships, based mainly on face-to-face contact, which is interconnected with the system of economic relationships;
- The presence within the area of complementary competencies and skills;
- Facilitating the creation and growth of innovation-based companies through incubation and spin-off processes, and provide other value-added services together with high quality space and facilities;
- Creating a culture of innovation where the physical infrastructure stimulates the cross-fertilisation of ideas and the flow of knowledge and technology to create the "buzz" that comes with shared exploits, innovation and dynamic social interaction; and
- A high degree of specialisation of both the firms and the workforce.

Both the Barn and the Innovation Hub are not-for-profit incubators and the owners do not hold equity in their tenants. They have close links to each other and often network and share resources. CITI and the Innovation Hub have strengthened existing ties through an informal partnership that is aimed at consolidating the activities of both parties for the greater benefit of the ICT sector nationally. This includes sharing knowledge resources, such as ICT guest speakers and information on high-profile international delegations to South Africa.

The two case studies clearly underline the importance of local and regional policies in promoting ICT clustering dynamics. Focusing merely on national policies is insufficient. Further, the close proximity to centres of teaching and research is particularly favourable for the creation and growth of knowledge-based businesses. Both the Bandwidth Barn and the Innovation Hub are innovative ICT clusters which (1)

have formal operational links with centres of knowledge creation, such as universities and research centres; (2) are designed to encourage the formation and growth of innovative businesses; and (3) have a management function which is actively engaged in the transfer of technology and business skills to "on-park" located small high-tech firms. Moreover, the objectives of the two technology incubator programmes are to: (1) provide a mechanism for the commercialisation and transfer of technology; (2) promote the concept of growth through innovation and application of technology; (3) support economic development strategies for small business development; and (4) encourage growth from within local economies.

GENERALIZABLE ISSUES

Entrepreneurship is at the heart of sustainable, organic growth for most developed, as well as transition and developing economies, and high-tech incubators have often served as catalysts and even accelerators of entrepreneurial cluster formation and growth (Harwit, 2002; Link & Link, 2003). This may be more so in less developed economies where incubators can help bridge knowledge, digital, socio-political and even cultural divides and help increase the availability, awareness, accessibility and affordability of financial, human, intellectual, and even social capital, the key ingredients of entrepreneurial success. Incubation has recently experienced increased attention as a model of start-up facilitation in the ICT sector (Molnar, Grimes, & Edelstein, 2001). Venture capitalists see incubators as a means to diversify risky investment portfolios, while would-be entrepreneurs approach incubators for start-up support. Incubators are thus faced with the challenge and the opportunity of managing both investment risks, as well as entrepreneurial risks.

There is value in establishing innovation hubs or clusters as an appropriate vehicle to help promote and facilitate the development of ICT firms within incubation programmes in developing countries. However, it is evident that science parks and incubators take place in different environmental and institutional contexts, which are also dynamic. This points to the need for a structural contingency perspective that relates the different types of science parks and incubators to different institutional contexts and objectives. Furthermore, the needs of tenant incubators at different stages of development are varied. Hence, if the purpose is to assess whether or not a particular incubator programme is of value to tenant incubators at different stages of business development, the comparative evaluative approach should be modified so that the effects on technology firms throughout the venture development path could be captured. For

cluster formation in the ICT sector to be successful, the innovation hub should: (1) be sustainable; (2) have operational links with universities, R&D centres and/or other institutions of higher education; (3) encourage and support the start-up and incubation of innovative, high-growth and technology-based companies; and (4) stimulate the transfer of technology, know-how and innovation.

CONCLUSION

Despite the fact that the cost of transmitting information has declined tremendously and has become largely invariant of distance, the importance of location to innovation and production remains. The primary reasons for this are benefits that the proximity of others generates to the firms in the area, i.e. Marshallian externalities (Marshall, 1920). ICT companies located in the area of a specialised cluster of firms may benefit from knowledge spillovers: information concerning new applications or other innovative practices may spread faster among the firms that are located geographically closer to each other. As the two case studies have revealed, there are other factors fostering spatial agglomeration such as the availability of skilled labour, good infrastructure, and supporting institutions, e.g. universities and research centres.

Both the Innovation Hub and Bandwidth Barn are examples of innovation being driven in an institutional way. Castells and Hall's (1994) concept of technopoles aptly describe the Blue IQ and CITI initiatives, viz. "deliberate attempts to plan and promote within one concentrated area, technologically innovative, industrial-related production" (Castells & Hall, 1994, p. 8). However, both of these clusters are still at a very early stage of development, therefore it is difficult to critically assess their success. That said, international experience suggests that few incubators succeed, and those that do are driven by experienced, hard-core entrepreneurs (Colombo & Delmastro, 2002, p. 1103). Ultimately, the success of the Innovation Hub and the Bandwidth Barn will be determined by how much venture capital experience and business experience that the people running them have. Finally, ICT-based innovative clusters in the Third World must be strategic, properly managed and implemented, without becoming bogged down in politics and bureaucracy.

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KEY TERMS

Agglomeration Economies: Refers to the spatial concentration of economic activities. For example, a firm that is located in close proximity to other firms in the same industry can take advantage of localisation economies. These intra-industry benefits include access to specialised know-how (i.e., knowledge diffusion), the presence of buyer-supplier networks and opportunities

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for efficient subcontracting. Employees with industry-specific skills will be attracted to such clusters giving firms access to a larger specialised labour pool. Another case of agglomeration economies external to the firm relates to benefits that accrue from being located in close proximity to firms in other industries, i.e., urbanisation economies. These inter-industry benefits include easier access to complementary services (publishing, advertising, banking), availability of a large labour pool with multiple specialisation, inter-industry information transfers and the availability of less costly general infrastructure.

Business Incubators: Business Incubators are property-based organisations with identifiable administrative centres focused on the mission of business acceleration through knowledge agglomeration and resource sharing. The main role of the incubator is to assist entrepreneurs with business start-ups and development.

Clustering: This occurs when high-tech firms of similar characteristics and within the same value chain are attracted to co-locate and gradually emerge as a strong allied group complementary to each other. An innovation-driven cluster aims to encourage and facilitate the formation and growth of ICT-based businesses by providing access to structural elements, e.g. infrastructure and supporting facilities, and generating mutual synergies.

ICT Sector: The ICT Sector can be defined as a combination of manufacturing and services industries that capture, transmit and display data and information electronically.

Information and Communication Technologies (ICT): The term "Information and Communication Technologies (ICT)" reflects the technological convergence between digital computing, telecommunications and broadcasting. Whereas computers were largely focused on the processing of information, ICT undertake both processing and communication of information.

Innovation Hubs: Are designed to encourage the formation and growth of knowledge-based enterprises or high value-added tertiary firms. Innovation hubs generally aim at promoting and catalysing innovation and entrepreneurship within an innovative milieu.

Knowledge Economy: The knowledge economy is a state of economic being and a process of economic becoming that leverages, both intensively and extensively, knowledge assets and competences, as well as economic learning to catalyse and accelerate sustainable and robust economic growth.

Science Park: A Science Park is a business support initiative whose main aim is to encourage and support the start-up and incubation of innovative, high-growth, technology-based businesses through the provision of infrastructure and support services, including: (1) collaborative links with economic development agencies; (2) formal and operational links with centres of excellence such as universities, higher education institutions and research establishments; and (3) management support actively engaged in the transfer of technology and business skills to small- and medium-sized enterprises.

Cognitive Theories and the Design of E-Learning Environments

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INTRODUCTION

The explosive growth of the Internet and the dramatic advances in the design and development of online technological tools in recent years have revolutionized the way students and teachers view technology in education. These technical advances have made it possible to produce educational materials and transmit them over the Web. Parallel to these technological advances, the field of instructional design has made phenomenal contributions to curriculum planning. A synergy of these two fields would enable educators to produce effective electronic educational materials.

Unfortunately, a great majority of e-learning sites that use online tools lack appropriate theoretical foundations for curriculum content organization. These sites, all designed by highly intelligent and well-intentioned educators, use online technologies without any regard for application of pedagogy to the design of courses. The result is an iceberg-like curriculum where, at best, online technologies have been used to cover the tip of teaching and learning, leaving little time and effort for the students to delve into deeper understanding of curriculum and problem solving. There is a fundamental need for pedagogical approaches to design e-learning environments whose foundations are supported by effective theoretical foundations.

One of the most effective approaches to developing appropriate pedagogical models for the design of e-learning is to understand how cognitive development occurs naturally. Cognitive developmental theories attempt to explain cognitive activities that contribute to the learners' intellectual development and their capacity to solve problems. Once we understand how cognition develops, we can derive a pedagogical model from it and then design effective e-learning environments that are responsive to how people learn naturally. In what follows, I will discuss Piaget's cognitive theory and derive an inquiry-training model from it. Then I will discuss the design of an e-learning environment that is based on Piaget's model and is adaptive to the cognitive needs of students.

PIAGET'S COGNITIVE DEVELOPMENTAL THEORY

Piaget (1952) argued that children must continually reconstruct their own knowledge through a process of active reflection upon objects and events until they eventually achieve an adult perspective. To have a better appreciation of this process, it is essential to understand four other concepts that Piaget proposed. These concepts are schema, assimilation, accommodation, and equilibrium.

Schema

Piaget (1952) used the word schema to represent a mental structure that adapts to environmental patterns. In other words, schemata are intellectual structures, in terms of "neuron assemblies," that organize perceived events and group them according to common patterns. Pearson and Sapiro in the May 1982 issue of Instructor have provided one of the earliest and probably the best explanations of schema theory for instructional purposes:

What is a schema? It's the little picture or associations you conjure up in your mind when you hear or read a word or a sentence. You can have a schema for objects (chair, boat, and fan), an abstract idea of feeling (love, hate, hope), an action (dancing and buying), or an event (election, garage sale, and concert). It's like a concept but broader. For example, you see the word tree and you conjure up the concept of a tree-trunk, branches, leaves, and so on. Your schema for a tree includes all this, plus anything else you associate with trees—walks down country lanes, Christmas trees, birds' nests, and so on. A schema includes behavioral sequences, too. For example, your schema for the word party could include not only food, friends, and music, but also what you will wear, how you will get there, how long you plan to stay, and so on. And, of course, your schema for party is based on your experience at party, which may differ substantially from someone else's. Schema is an abstraction of experience that you are constantly fine-tuning and restructuring

according to new information you receive. In other words, the more parties you attend the more schema adjustment you'll make. (p. 46)

Schema is not limited to concepts, objects, data, and their relationships. There are also procedural schemata (Anderson & Pearson, 1984), which are the ways of processing information. For example, students who have acquired the basics of mathematics, such as adding, multiplying, dividing, and subtracting, have internalized the concept schemata about these mathematical operations. However, as the students grow, they gain new abilities to solve problems that are related to mathematical concepts. The ability to solve problems is a procedural schema. Both concept and procedural schemata are constantly restructured as new learning environments are introduced to the learner.

Assimilation, Accommodation, and Equilibrium

One of the most fundamental questions about schemata is how are they restructured when new data or patterns are discovered in the environment? Piaget was a biologist by academic training. He was very comfortable with the concept of biological adaptation to environmental stimuli. For example, from a biological point of view, the human body is structured to be constantly in a state of equilibrium in regard to its temperature. When the body temperature is raised by a few degrees during exercise, the entire system goes into a state of disequilibrium. The feedback mechanism senses such a state of disequilibrium and internally responds by producing sweat and sending more blood near the skin to cool the body down, thus, restoring a state of equilibrium for the body.

Piaget used the same concept of biological equilibrium-disequilibrium states to explain the causes of cognitive restructuring in response to new learning experiences. For example, when students encounter a new learning environment, a state of disequilibrium is created within their brains that must be internally managed. In other words, the new learning environment has placed the brain in a state of disequilibrium. In order for the brain to get back to the state of equilibrium, the learner has to add, modify, or restructure his or her schemata to account for the new situation. The internal mental mechanism or processes that are responsible for the restructuring of schemata so that the brain can get back to an equilibrium state is called assimilation and accommodation (Piaget, 1952, 1964).

Assimilation is the cognitive process by means of which people integrate new patterns, data, or processes into their existing schemata. Piaget argued that, as learners assimilate input from the environment, the new information is not simply stored in the mind like information in files in a filing cabinet. Rather new information is integrated and interrelated with the knowledge structure that already exists in the mind of the person. "Every schema is coordinated with other schemata and itself constitutes a totality with differentiation parts" (Piaget, 1952, p. 7).

For example, in teaching geometry, when a pentagon is introduced to children, the salient features of this geometric shape such as sides and angles are not simply memorized. Rather, it is contrasted and integrated with what is already known about other geometric shapes like rectangles, triangles and squares. In other words, the schemata for a pentagon includes, in addition to its shape, sides, and angles, such related concepts as how its shape compares with other geometric shapes, how its angles compare with other geometric shapes, or how its area and perimeter differ from other geometric shapes. Learning in this manner of relating prior knowledge to new information is said to be meaningful because new schemata in the child's mental capacity have been formed.

Theoretically, assimilation does not result in changes or restructuring of the schemata. Rather assimilation is the process of placing new information into existing schemata. Assimilation can be compared to the air that you put into a balloon. As you put more air in the balloon, it gets bigger, but the shape of the balloon does not change. The actual change or restructuring of the schemata occurs in the accommodation process.

The change that occurs in the mental structure of schemata is referred to as accommodation by Piaget (1952). Upon facing new learning environments, sometimes the learner's schemata can not assimilate the new information because the patterns of the new stimuli do not approximate the structure of the existing schemata. In such cases, one of two things can happen: The learner can create either new schemata or modify the existing schemata. In either case, the structure of schemata is being changed so that it can accommodate new information. Therefore, accommodation is the creation of new schemata or modification of old schemata. In both of these cases, the result is a change in the cognitive structure or the overall structure of schemata.

The process of cognitive development is the result of a series of related assimilations and accommodations. Conceptually, cognitive development and growth proceeds in this fashion at all levels of development from birth to adulthood (Piaget, 1964). However, because of biological maturation, major and distinctive cognitive development occurs over a lifetime. Piaget (1964) posited four major stages of cognitive development that occur over a lifetime. These stages are sequential and successive. According to Piaget, these stages are Sensorimotor (birth to two years old), Pre-Operational (2 to 7 years

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old), Concrete Operation (seven years to adolescence), and Formal Operation (Adolescence to adult). I will limit my description of the stages to the Formal Operation because it is most relevant to the purpose of this article.

The Formal Operational stage of development generally begins in early adolescence and continues through adulthood. Formal reasoning is characterized by the ability to carry out mental activity using imagined and conditional actions and symbols that are divorced from their physical representation. Individuals at this stage are able to control variables systematically, test hypotheses, and generalize results to future occurrences. This stage, which continues to develop well into adulthood, is characterized by the ability to reason and solve problems.

An influential scholar who has continued Piaget's work in the area of formal operational is Flavell (1983). He has provided a detailed discussion of three operations that young adults gradually acquire during the Formal Operation of their development. These operations are combinational reasoning, propositional reasoning and hypothetical-deductive reasoning.

Combinational reasoning refers to the ability of the adolescent to consider several different factors at the same time to solve a problem. This reasoning power provides learners with the ability to look at problems from an integrated approach. During earlier stages, children are not capable of integrating several viewpoints to solve problems. They can only deal with problems from one angle at a time. However, as adolescents mature into adulthood, they develop combinational reasoning which allows them to integrate several viewpoints to problem solving.

Propositional reasoning refers to the characteristic that young adolescents acquire to reason on the basis of assumption and proposition to solve problems. For example, if a child during the Concrete Operational stage were asked to assume that coal is white, the child would respond that coal is black and can not be white. However, during the Formal Operation stage, the young adults acquire the capability of assumption and proposition to solve problems that would not have been solved during the Concrete Operational stage. This ability also extends to abstract thinking that is acquired during the Formal stage.

Hypothetical-deductive reasoning allows the young adolescent to consider different hypotheses in dealing with a problem. Consideration of different hypotheses also enables the young adolescent to gather data and test different hypotheses to come up with a possible solution.

To illustrate how adolescents follow hypothetical-deductive reasoning in everyday life, let's consider a simple example. Let's say that there is a young 15-year-old girl who is going on her first date. In order to get ready for her date, the young lady goes into her room and gathers several different colored blouses and matching pants.

She puts on a blouse and tries it with different colored pants while looking at her choice in the mirror. She may reject this combination, and so she tries another blouse with different pants. After several tries, she decides to wear the blue blouse with the black pants. This process of selection of what to wear is natural to most young people.

The instructional implication of such a procedure is significant. What the young lady has learned to do because of her recent development of hypothetical-deductive reasoning is the ability to hypothesize and test a situation. In order to solve the outfit problem, she first hypothesizes something about her taste in what looks good, and then she gathers information (her clothes). She then tests her hypotheses that some colors may go with others. She tests every one of her choices in color. She either accepts or rejects her choices. She makes a final decision, based on her original hypothesis and her testing, as to what looks good for her date. The final selection is the result of careful analysis, testing, and acceptance.

The above scenario may be a simplistic explanation of hypothetical-deductive reasoning. However, it is exactly what adolescents and scientists do in the process of solving problems. Both the adolescent and scientist follow an inquiry process when they are faced with a new situation. That is to say, when they are faced with a problem, they use their hypothetical-deductive reasoning to solve it. This process of hypothetical-deductive reasoning can provide a foundation for a pedagogical approach to education and the design of e-learning environments.

COGNITIVE THEORIES AS THE BASIS OF PEDAGOGY

Cognitive and developmental psychologists, Piaget in particular, viewed learning as a dynamic process where learners construct their own knowledge by interacting with the world. The role of teachers, they believe, is not to impose steps, procedures, and rigid structure, but rather to be the architect for learning environments that facilitate a process in which students would be able to construct their own knowledge. This radical approach gave rise to a new group of educators and technologists who became collectively known as constructivists. Piaget's influence upon the constructivist's movement in the U.S. had a great impact on instructional design, teaching models, and educational technology. The main impact of constructivism can be seen mostly in inquiry-training.

Based on Piaget's theory of cognitive development, Suchmann (1962) proposed a constructivist approach

for instruction in school which he called an inquiry-training model. The general goal of inquiry-training is to help students develop a sense of the independent inquiry method but in a disciplined way. The process of the inquiry-training model is similar to Flavell's hypothetical-deductive reasoning description that allows the young adult to consider hypotheses, to gather data, and test different hypotheses to come up with a possible solution in dealing with a problem. The inquiry-training model of teaching has the following five phases of instruction:

- **Phase One:** Puzzlement or intellectual confrontation by presenting students with the problem to create a state of disequilibrium in their mind.
- **Phase Two:** Students will hypothesize a reason for the puzzlement.
- **Phase Three:** Students will gather new information in regard to the hypothesis. Then they isolate relevant information, eliminate irrelevant information, and organize the information.
- **Phase Four:** Students analyze the data they have gathered, organized, and then test their hypothesis to postulate a possible answer to the original puzzlement.
- **Phase Five:** Students are evaluated to ensure their understanding of the concept(s) in the intellectual puzzlement.

Instruction in inquiry-training begins by the teacher modeling, a situation that is puzzling to the students. Such an approach, which can be called an intellectual confrontation, places students' minds in a state of disequilibrium. After the modeling of the puzzling situation, students make a hypothesis about the intellectual confrontation. During the next phase, students are provided appropriate sources in the environment. Then, students are asked to organize their data in order to provide support for their hypothesis. Next students are guided to carry out experimentation and to eliminate irrelevant information. The final phase of inquiry-training involves an analysis of organized data by the students and the development of a conclusion that provides a possible answer to the original hypothesis that may explain the original puzzlement.

INQUIRY-TRAINING AND E-LEARNING

With the explosion of the Web as a medium of delivery for instruction, the popularity of the contructivism movement and the inquiry-training models of teaching also took a rise in popularity. Proponents of the inquiry-training model often expressed their dislike for the traditional computer-based approach of tutorial and practice

and drill. With the rise of the Web and hypermedia, the philosophy of inquiry-training was applied to technology under a variety of different terms such as project-based training, guided inquiry, inquiry-based, problem-based learning, and resource-based education.

All of these different approaches to the inquiry-training process share attributes that were first proposed by Suchmann (1962). The vast majority of these methods emphasize the same attributes that can be summarized into how to hypothesize, find, gather, evaluate, and organize information to find a possible answer to an intellectual confrontation. In one form or the other, these steps have been used to design and develop hypermedia-based instructional materials.

NASA has developed several successful and effective e-learning sites using the inquiry-training model. One such program is Astro-Venture (http://astroventure.arc.nasa.gov) for students in grades 5-8 where they role-play NASA occupations as they search for and design a planet that would be habitable to humans. This site was developed under the direction of Christina O'Guinn of the NASA Ames Educational Technology Team. Astro-Venture uses online multimedia activities and off-line inquiry explorations to engage students in guided inquiry aligned with Suchman's inquiry-training model.

In Astro-Venture, students are first presented with the intellectual confrontation of how to design a planet and star system that would be able to meet their biological survival needs. Students hypothesize about the aspects of Earth and our star system that allow human habitation. As newly accepted members of the Astro-Venture Academy, they are informed that they will be working closely with NASA scientists who will help them in their research to better understand how the Earth meets human biological needs and, thus, the essential elements in designing a habitable planet.

Students conduct this research by engaging in multimedia training modules that allow them to change astronomical, atmospheric, geological and biological aspects of the Earth and our star system and to view the effects of these changes on Earth. By focusing on Earth, students draw on their prior knowledge that helps them to connect their new knowledge to their existing schema. Cause and effect relationships of Earth provide a concrete model from which students can observe patterns and generalize abstract results to an imagined planet. From these observations, students draw conclusions about what aspects allowed Earth to remain habitable, and they observe large themes such as the many conditions that play a role in allowing Earth to have liquid water.

Once students have generalized needed conditions of "what" we need for a habitable planet, they conduct further research in off-line classroom activities that also

follow the inquiry model and help students to understand "why" we need these conditions. These off-line activities engage students in explorations that guide them in discovery learning of concepts. For example, after gaining an understanding of the differences between solids, liquids and gases, students hypothesize a cause for changes of matter from one state to another and design experiments to test their hypothesis. From this experimentation they "discover" that temperature is a vital condition for changing states of matter, and they conclude that a moderate temperature is necessary for allowing water to remain a liquid on Earth's surface at all times. Students also explore concepts such as systems, as they begin to combine different variables symbolically, and observe that many of the required conditions work together and cannot be isolated from others.

After students have mastered the "whats" and "whys," they engage in multimedia mission modules that simulate "how" scientists might search for a planet and star system that meet these requirements using the inquiry process.

Students then simulate the methods scientists might use to collect data on various stars and planets to deduce whether the star system meets the requirements for habitability or not. After collecting and analyzing this data, students are asked to draw conclusions in comparing their results to their initial hypothesis.

CONCLUSION

The cognitive approach that impacted the development of constructivist e-learning has a stronger basis in learning how to learn than the traditional structured approach. It also provides a new approach to the new attributes, such as hypertext and hypermedia, that are found in modern technology. Many of the concepts that I presented in this article such as the inquiry-training model and the discovery-learning approach have influenced the development of successful and effective e-learning environments. Because the cognitive approach criticizes procedures, steps, and the rigid design of instructional materials, it is often much more difficult and more expensive to design and develop e-learning environments based on it. However, high cost and difficulties in design should not be the basis of what kind of effective e-learning site one should develop. If your research shows that a cognitive approach is the best suited for your project, then it must be implemented.

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KEY TERMS

Accommodation: A mental process individuals use to create new schemata or modify old schemata as the result of interaction with new environmental stimulus. Both of these actions result in cognitive development.

Assimilation: The cognitive process by means of which the person integrates new perceptual matters or stimulus events into existing schemata or patterns of behavior.

Constructivism: Piaget influenced a great number of educational theorists in the U.S. who initiated a constructivism movement in education and educational technology. Constructivist educators argued that children must continually reconstruct their own knowledge through active reflection on objects and events until they eventually achieve an adult perspective.

E-Learning: In its strictest sense, e-learning covers training, teaching, and learning programs that use networked technologies as the medium of choice to deliver instruction.

Inquiry Training: A structured teaching model that allows individuals to learn the way scientists learn. Such a model follows specific phases of instruction that include solving a real problem by making hypotheses, gathering and organizing data, and testing different hypotheses to come up with a possible solution in dealing with a problem.

Schemata: Piaget used the term schemata to refer to the cognitive or mental structures individuals use to intellectually adapt to the environment.

Connecting Dispersed Communities on the Move

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INTRODUCTION

Travel assists the development and maintenance of social networks from the local to the global by connecting people to places. The time spent travelling has tended to be regarded by many analysts as a necessary sacrifice to achieve this connectivity. Accordingly, the expansion or dispersal of communities has been a function of journey times, limited in turn by journey speeds in the face of increasingly congested transport networks. Yet in a world being transformed by Information and Communication Technologies (ICT), this article contends that there is now a need to examine more closely the presumption that travel time is "wasted" and indeed to consider how, with the aid of ICT, this time might be being used to sustain or even encourage the dispersal of communities.

The article considers existing debates surrounding travel time use from transport studies and the social sciences to develop an agenda for conceptualising travel time use in relation to dispersed communities. The first section summarises concepts of spatial regions and regional-based activity that inform the study of mobility and transport. It argues corporeal travel remains necessary to sustain social and business networks that interweave local, regional and global geographic spaces. The discussion moves on to the experience of travelling and travel time use in the second section. Here, research into travel and mobile technologies illustrates the positive utility of travel time, and how mobile technologies reshape spatial connections on the move. The final section considers new modes of enquiry to explore this research area.

SUSTAINING DISPERSED COMMUNITIES

Travel and communication infrastructures facilitate regional connectivity in bringing together people, objects and places (copresence). Each academic discipline approaches regional division and connectivity with differ-

ent assumptions about society, urban design, and the role of technologies (Amin & Thrift, 2003; Graham & Marvin, 2000).

Social science debates exploring ICTs concentrate on the historical technological shrinking of time-space that has enabled the emergence of new global industrial relationships and employment practices (see for example Castells, 1996; Harvey, 1990). The telephone supports and maintains locally and regionally distributed kinship networks, particularly where the opportunity to travel for face-to-face meetings is limited by time and money (Licoppe, 2004). Yet, in an age of mediated communications (phone, email, etc.), copresence remains an important function of social practice (Boden & Molotch, 1994; Urry, 2003). Thus, as Urry (2002) argues, the relationship between copresence, social networks and mobility infrastructures warrants a more detailed understanding.

Discussions about copresence and accessing activities assume spatial separation and zoning of activities (e.g., central business districts and suburban housing). Planning and analysing industrialisation and urbanisation established the notion of spatially zoned activities (Harvey, 1990; Lash & Urry, 1994). Notably, the home-work-leisure relationships produced through a time economy (the division of paid labour and leisure time) frame discourses of produced space, i.e. urban space that is planned in relation to the economy and fixed capital investment.

The time economy, based on clock time as a quantifiable mechanism for measuring output, is central to concepts of productivity, values of time, and the ordering of everyday social practices (Adam, 1990; Thompson, 1967). Work at the factory and office has developed around predefined hours shaped by work-related legislation (e.g. nine to five, Monday to Friday), as well as at specific locations. "Work time" then implicitly frames the notion of "free time"[1].

More recently, these traditions of "working hours" have started to dissolve with the development of global trading, the Internet, and call centre service provision (e.g. shopping and banking), etc., where working hours have extended to correspond with international time zones

and the move towards a 24 hour culture (Krietzman, 1999). The information age is leading towards new employment practices and management structures (e.g. contract work, a growing mobile work force, and teleworking), which suggest a blurring and break down of traditional time-space boundaries (Castells, 1996; Lash & Urry, 1994).

Copresence remains a central part of everyday life *despite* the potential of mediated communications (letters, email, phone, the internet, etc.) for substituting the need to travel to places to see people, and impacts on everyday and less regular transport requirements, schedules and expectations of punctuality. Urry (2002) argues face-to-face communication, or being in a particular place, are embedded in social and cultural practice and obligations, and notions of social inclusion. Boden and Molotch (1994) argue from research into workplace communication that face-to-face contact is important at a number of levels including the non-verbal and informal talk. Rituals of copresence are institutionalized in many other aspects of life such as weddings, demonstrations, parliament and the legal system (Urry 2002).

Yet, until recently social scientists have paid little consideration to the mechanisms by which copresence is achieved. Urry (2002, 2003) argues the importance of developing a "sociology of mobility", and there is a move towards understanding the urban as constituted by flows of mobility (corporeal and virtual) and nodes of intersection (Amin & Thrift, 2002; Graham & Marvin, 2000). Travel time use has mainly emerged in the analysis of the experience of driving (for example Miller, 2000).

In contrast, activity modelling in transport studies has sought to address behavioural questions surrounding the transport demands produced by copresence and the movement between the "activity" locations. Activity modelling, with transport economics, focuses on destination and travel mode choice and value of travel time savings (see for example Metz, 2002; Mokhtarian & Chen, 2004). Here travel time is conceived as unproductive or wasted time, or at least as time that could be "better spent" if not required for travel. This assumption has led to two main research trajectories. Firstly, quantifying travel time "budgets", and, secondly, calculating monetary values for units of travel time and how much people are willing to pay for travel time savings (e.g. for evaluating investment into high speed trains or toll roads).

The notion of a travel time budget argues that there is a limited amount of time that people are prepared to, and indeed do, commit to travelling, which implies that faster (and flexible) travel enables more (or better quality) activities to be accessed over greater distances (Mackie et al., 2003; Mokhtarian & Chen, 2005). How much time is given to a destination activity also reflects on how much time people are prepared to travel for the activity (Schwanen & Dijst, 2002).

Transport economists calculate the values of travel time savings to inform investment in to new or improvements to transport infrastructures that reduce travel times (Hensher & Goodwin, 2004; Jara-Días, 2000, Mackie et al., 2003). In debating existing research, Mackie et al (2003) argue the average value of business time is four times that of non-working time, and different modes (car, bus and train) carry relative values of time. Jara-Diaz (2000) argues that travel time savings enable increased levels of economic output through greater time spent on production, and that time savings improve quality of life.

In summary, where time is equated with production and a time economy, travel time use is perceived as a quantifiable resource. Concepts of copresence, along with the activity modelling approach, provide a rationale as to why people come together at specific locations and times. However, the focus on connecting spatially separate activities and reductions in travel times has lead to a lack of understanding of the mobile subject (the traveller) and how travel time is and can be used. The incorporation of mobile ICT into everyday social practice specifically provides a new trajectory for travel time use. The section below develops the argument of mobile ICT and mobility to explore the question of connection to multiple regions in relation to travel time use and traveller identity.

TRAVEL TIME USE IN THE INFORMATION AGE

The discourse of travel time is at the brink of change. In the UK, rail companies have integrated laptop sockets into train design and are exploring on-board "wi-fi" connections. Concern over mobile phone use while driving has changed UK legislation. While grappling inconclusively with the positive utility of travel time in transport models, transport planners and providers recognise the importance of travel environment design in affording a space to work and communicate (see Cohen & Harris, 1998; Mackie et al., 2003). New methodologies are required for evaluating this development.

Emerging from debates about travel budgets, Mokhtarian and Chen (2004), consider how travel time might be a positive utility, beyond accessing the destination. They argue that the physical and psychological experience of travelling (e.g. driving), activities conducted while travelling, and travel time as "time out", all contribute to travel time having a positive utility (see also Mokhtarian et al., 2001; Pazy et al., 1996). Their arguments points to a need for transport studies to develop its understanding of travel time use.

Other studies in the social sciences consider travel time as part of wider mobility debates. The positive utility of travel time is identified in a number of mobile practices

such as reading documents, making phone calls, planning the day ahead, listening to music and daydreaming and, the creation of individual identity (see Bull, 2000; Davies, 2001; Edensor, 2003; Haddon et al., 2002; Laurier & Philo, 2001; Pearce, 2000; Perry et al., 2001). These debates extend the concept of travel time use to viewing the mobile individual as a node connected to heterogeneous networks of regional flows, and the movement of the consciousness (imagination, memory, everyday thoughts) between temporal regions of past, present, and future. These authors illustrate how travel time can be appropriated for mundane work or transformed into a fantasy space. Importantly, the journey is often constructed as bridging two worlds, and thus time to re-formulate identity.

A growth in the mobile workforce presents a way of connecting the discourse of travel time from social science and transport studies. Business travel often frames the justification of travel time savings, as discussed earlier, but research into mobile technologies and business practices indicates how travel time is usually carefully planned and re-appropriated rather than being lost or wasted. A study of mobile workers observed the pre-planning of "on-the-move" activities (Perry et al., 2001). Paper documents, mobile phones and laptop computers were integral to this process, but reflected the form and duration of travel, and availability of power supplies and signals.

Paper documents and mobile technologies connect the mobile worker to spatially and temporally distant regions in their everyday working practices. Specifically, electronic media (the internet and mobile phone) take a key role in connecting mobile workers to HQ to obtain real-time information (facts and figures, reports, updates, etc.), and to proximate and distant clients, often with reference to the future objectives (planning strategies, sales pitches, or re-arranging meetings) (Laurier & Philo, 2001; Perry et al., 2001). Electronic media also maintain personal relationships during the course of work away from home. However, as Urry (2003) points out, some contact can be an unwelcome intrusion.

The use of paperwork and electronic media for work related productivity is tangible for quantification, but Pazy et al. (1996) points out that "unassigned" time can also benefit the individual. Reading for pleasure, listening to music, daydreaming, sleeping all transform the travel experience but are difficult to evaluate in relation to the time economy.

The ability to listen to your own personal selection of music through a personal stereo, especially when commuting, Bull (2000) argues, provides an individual with a way of regaining control over travel time and "transforms it into an experience of freedom" (p. 58). Bull's research participants travelling around London illustrate a complex notion of travel time. By regaining control over "unproductive" travel time, people construct travel time as "time for them-

selves" through activity, in this instance, listening to music. Bull (2000) reports journey duration has to be in tune with the selected listening, where research participants stated they specifically selected a slower mode (e.g., bus over underground rail) or walked a longer route to have enough time to listen to their *own* music selection rather than the shared choices at home or elsewhere.

Pearce (2000) and Edensor (2003) expand this discussion of music and travel through autobiographical analysis of driving. For Edensor (2003) choosing "drive-time" music to accompany the drive along the M6 (a motorway in Britain) is contextualised by the tempo of driving (speed, congestion, etc.) and the collective memory of past trips from his own experiences and the urban myths of motorway travel. Pearce (2000) uses the north-south drive between own home and parents home to illustrate how the music selected for the journey becomes integral to forging a bridge between her present life with her past life and parental expectations.

The accounts of travel presented above indicate a varied response to travel time, its use and the importance connection in space and time. Travel time use and travel budgets are based within quantifiable measures within the paradigm of the time economy. However, travel is rooted in more complex sets of negotiations, whether routine travel to work or shops, or the less frequent or regular routes and times of businesses travel and maintenance of kinship networks. The exploration of how electronic media provide new opportunities for connectivity and productive time use is one trajectory, but the use of personal and car stereos sparks other sets of time-space understandings. Exploring travel time use, therefore, presents a complex research agenda.

SETTING AN AGENDA FOR TRAVEL TIME USE RESEARCH

From the above discussion, the social science approaches present a detailed reflection on the mobility practices that currently elude transport models. Forging connections between the two disciplines is a key trajectory for the future of this research area. In particular, crossing disciplinary boundaries requires the appraisal of the epistemological and ontological differences in order to develop new methodologies and research questions, and ability to argue with qualitative data that writing business strategies *and* daydreaming command value in a discipline shaped by quantitative understandings when assessing the positive utility of travel time.

Concepts of "multiplicity" or seeing the individual subject as a node in a web of connections, balanced between spatial and temporal regions, falls outside the realm of most transport planners, economists and prac-

titioners. Yet transport professionals, through the planning, design and management of transport infrastructures, actively produce the opportunity for corporeal and electronic connectivity.

Social scientists have not rigorously addressed the issues of travel time use and the mobile individual as situated within a network of regional connectivity as a specific research topic. The discussion and arguments presented above emerge from wider debates of work practices, new technologies, concepts of mobility spaces, and feminist understandings of subjectivity. However, this body of work indicates the possibility of new methodologies of investigating and understanding corporeal mobility alongside the uptake of new technologies, and embedded practices of existing technologies (e.g., listening to music). It also illustrates the possibility of "being" in more than one place, as the mobile individual flits between the "virtual" regions of, for instance, the home and work, and between the past, present and future times, whether in the imagination or through mobile communications, while physically moving between places in chronological time.

The question can no longer be "Is travel time wasted or not?" There is a need to broaden understanding of *how* people use travel time to maintain connections. For the development of new technologies (e.g., mobile phones and wireless internet), and the use of these technologies in transport systems, this is key in understanding not only that these technologies have a function (they can be used on the move), but the way in which society incorporates these technologies into everyday practice. Further research may reveal that the use of mobile technologies while travelling affords more opportunities for maintaining and strengthening social and business networks, thus having a positive effect on sustaining regionally dispersed relationships.

The use of travel time in constructing individual subjectivity also indicates the importance of travel time as "time out "or "time for the self", which evades quantification. This raises two key points. Firstly, how does this "non-quantifiable" use of travel time enter the discourse of the economic appraisal? Secondly, as Pazy et al. (1996), Pearce (2000), and Mokhtarian and Chen (2004) point towards, how does travel bridge the psychological gulf between subjective regions whether between work and home or own home and parents, and, in the world of international migration between adopted and home culture?

There is a huge gulf between the autobiographical approaches presented by Pearce (2000) and Edensor (2003), and the value of time evaluation by Mackie et al (2003). However, there is much to be learned from individual narratives in deconstructing meanings, assump-

tions and contradictions surrounding travel time use. Thus, this research topic can only gain by looking towards qualitative methodologies that seek individual narratives and practices through interviews, focus groups and ethnomethodology. Such approaches reveal how the mobile individual can act as a node within a network of flows connecting multiple spatial and temporal regions, and thus contribute to debates of conceptualising the region in a mobile society.

CONCLUSION

This article identifies a research gap in understandings of travel time use. In the context of sustaining dispersed communities electronic media present an opportunity to explore firstly how travel time can be used, and secondly, how social networks can be maintained and managed while on the move. The exploitation of these media has been identified in the context of business travel in connecting regions for resources and planning. However, not all travel spaces are suited to specific forms of media, and thus, paper retains an important role in enabling a productive use of travel time.

Measuring travel time use for commuting and other forms of travel (usually categorised as leisure) is more complex, as it falls outside the context of economic productivity, but consumes personal or leisure time as defined by the time economy. The personal stereo is one technology that illustrates the re-appropriation of travel time. Music redefines the travel space (whether on public transport or in the car) connecting the traveller within a web of collective memories associated with other spaces beyond the confines of the car, train or bus. The shaping of identity through daydreaming and music while travelling constructs travel time as an opportunity for bridging identities and the expectations of regionally different communities. Such practices indicate how mobile individuals need to re-orientate themselves to participate in multiple roles associated with spatial or regional difference.

The research agenda for travel time use in the information age, therefore needs to recognise these nuances of time and space, and consider how new discourses of "a positive utility" can be constructed. The article argues that narratives of travellers can provide insights into the complex negotiation of travel time and its relationship with spatial and temporal regions that are epistemologically different to the philosophy behind economic evaluations of travel time budgets and value of travel times savings. Thus, a key direction for the future of this research is to consider how such qualitative understandings of travel time use are translated into transport planning and provision.

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KEY TERMS

Copresence: The coming together of people (face-to face), people with objects (face-to-object), or people with places (face-to-place) in time and space.

Corporeal Mobility: Bodily movement between places such as by car, rail, or foot.

Social Networks: The tight or loose connections between people (family, community, associations, work, etc.) that are key to sustaining regional connectivity.

Time Economy: Time defined by clock time and production, where time in the form of labour is exchanged for money.

Travel Time Budget: The proportion of time allocated by individuals for travel per day.

Value of (Travel) Time: Economic costing of how much people are willing to pay for travel time savings for infrastructure investment.

Virtual Mobility: Movement of electronic data and information between locations, which includes telephone calls, emails, internet searches, etc.

ENDNOTE

[1]   Feminist critics argue that women's lives have never exhibited such clear boundaries (Daly, 1996; Davies, 2002).

Connecting the Unconnected in Rural Ireland

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INTRODUCTION

How to integrate ICT into schools in an appropriate and meaningful way remains one of the most fraught questions in education today as teachers and policy makers alike strive to make the most out of the Internet and other technologies in the classroom. Choosing appropriate content, building the necessary skills amongst teachers, finding a way to integrate computer-supported learning in all subjects, these are familiar issues.

But in the meantime the issue of basic access to the Internet still remains and should not be ignored. It is true that throughout the developed world, most schools have access to the Internet. Recent EU figures suggest that 90% of EU schools have Internet access, and this figure is growing all the time (EU, 2003). However increasingly narrowband access is seen as insufficient for real educational use, and provision of broadband access is seen as a major objective in educational ICT policy. In Northern Ireland, for example, the current ICT strategy has provided broadband access for all second-level schools. City schools are offered more and more choice as ADSL services roll-out and competition drives costs down. But what about the rural schools and schools in towns with populations too small to attract a competitive broadband offer? Despite the best efforts of all concerned, broadband access to the Internet in Irish schools remains considerably below European norms and there is a danger that Irish pupils will find themselves on the wrong side of a digital divide in terms of their access to and use of resources and opportunities afforded by fast access to the World Wide Web. Nolan Bowie notes for example that in the U.S. there is a geographical dimension to the digital divide, with rural families less likely to have access to the Internet than urban families (Bowie, 2000).

County Donegal is one of those remote and rural parts of Europe that has difficulty meeting the access needs of schools in the region with broadband only recently coming to the main towns in the county with little chance of its extension outside these towns in the coming five years. This is one of the reasons why Donegal was such an outstanding region to take part in a project to test the viability for schools to access the Internet via satellite in the European Space Agency (ESA) supported projec. (SchoolSat)

BACKGROUND

In most countries, the Internet is seen as a central component of educational ICT strategy. It is seen as important for a variety of reasons. In part, the Web can be seen as a vast library of resources, some of which can be used by both teachers and students to enrich teaching and learning. There is also an equality dimension to the resource view of the Web, as the smallest and most isolated schools with no library can access exactly the same online material as the biggest urban schools.

The Internet may also be a conduit for a new generation of educational software. For decades specialist software aimed at schools has been produced. Despite the success of the educational software sector in the home and training markets, little of it is in use in schools. The use of software in schools may have been constrained by logistical difficulties including licensing, installing the software, etc. Many of these difficulties can be avoided if educational material is available online, providing an easier solution in school, one that students can continue at home, and teachers can explore in advance with ease (OECD, 2001).

The need for Internet access in school also goes beyond the content of the Web. In part, "the medium is the message," as it becomes important for learners to develop information literacy. Negroponte, in his seminal book Being Digital, *describes a "post information age," where individuals have much greater control of the information they receive and send, where they can communicate with agencies in a "place without space," and where they can control more of the information they receive (Negroponte, 1995). This vision of a society with empowered individuals finding information as they need it and managing their own learning and information needs is an attractive one, but it is dependent on learners having the skills to deal with the vast amounts of material available to them.*

THE SchoolSat PROJECT

SchoolSat was a pilot project set up in 2001 to investigate the potential of a satellite to provide Internet connectivity for schools. The impetus for *SchoolSat* came from ATiT, a small Belgian firm, which had carried out research on behalf of ESA to identify those school populations in Europe most likely to benefit from satellite access. Putting together a consortium which included the National Technology Centre in Ireland (NCTE), Web-Sat, an Irish-based satellite service provider, and the Donegal Education Centre representing Donegal schools, ATiT applied for and were successful in attracting ESA funding for a pilot project in Donegal which ran from February 2002 to February 2003.

SchoolSat provided broadband Internet access to nine secondary schools in Donegal and the Donegal Education Centre (Who is). Each school was equipped with a small (84 cm) receive-and-transmit dish, connected to a dedicated computer that acted as the satellite gateway connected to the school's LAN and offering the Web-Sat Internet access service with up to 4Mb download to the school and 64 Kbits return. The schools taking part represented just under a third of the secondary schools in Donegal and included every type of second level school in the county, including vocational schools and community schools. The selection also included schools of different sizes, ranging from Carndonagh Secondary school, the largest secondary school in Ireland with about 1,350 pupils to the vocational school on Aranmore Island with just 43 pupils. Within the schools taking part, the teachers selected were also very mixed. They included maths teachers, history teachers, language teachers, physical education teachers, as well as several IT teachers. During the selection of teachers to take part, a conscious effort was made to include a representative group of teachers, rather than to select the most technically skilled. Once the project got off the ground, teachers in the schools taking part were supported in their use of the Internet through a series of workshops and regular contact with one another and the project team through an online computer conferencing system, FirstClass.

One of the first observations in *SchoolSat* was that the satellite system provided Internet access that was considerably faster than the previous access via ISDN (Reynolds, 2003). As the technology is already in commercial use with a range of clients, this observation wasn't a big surprise. But the fact that the satellite system was particularly useful in a schools context was.

When an individual is browsing, ISDN probably provides a reasonably fast response, and the speed of the response is often determined by the delays in the Internet, rather than the bandwidth of the connection from the ISP to the user. Internet connectivity in the somewhat un-

usual environment of schools is different for a number of reasons. One of them is the high concentration of traffic into particular times, which may have marked peaks. Classes using the Internet are likely to involve all students beginning their browsing within seconds of each other, while there may be other times when there is no use at all. In this context we refer to the SIP 069 pilot project where schools were given a computer room and ISDN line dedicated to use of the Internet in teaching and learning. When the project was evaluated in May 2002, teachers reported that sites like Skoool.(i.e., which were not used because they were too slow), and that "whole class" searching activities were also not viable, because "only the front row could get anywhere" (Mulkeen, 2002).

The faster access that *SchoolSat* provided enabled these kinds of uses of the Internet. In Carndonagh for example, they were able to use the Skoool (i.e., a site with 24 students online simultaneously). In Letterkenny, students could all access Hotmail at the same time, while before it used to take weeks just to get them all registered. In Buncrana the school reported that ISDN used to "grid to a halt" once there were more than six or seven computers connected, while they could now use the Internet with an entire class.

The increased speed of access changed thus the nature of usage in the school considerably. From the teachers' and schools' point of view, the satellite system opened up an entirely new way of using the Internet in the classroom. "For the first time," according to Colm Toland from Cardonagh school, one of the teachers taking part, "whole classes can use the Internet at the same time, something, which simply wasn't possible in the past." Students at Carrick Vocational School did not have any access to the Internet due to the lack of access facilities in the area. "*Schoolsat* has given us that access in a very efficient and effective way. Students and teachers can now make use of the wide range of educational material available on the Internet. Students will now be 'Internet ready' when they leave school to attend college or enter the workplace," according to George McMullin, another teacher taking part. All nine schools made valid educational uses of the Internet. In some cases these formed a substantial part of the teaching of a particular subject. A series of different types of activity like project work, reinforcement activities and whole-class teaching were carried out.

In this way, the *SchoolSat* project provided further insight into the question of the use of ICT to encourage a more progressive style of education, with more focus on students learning for themselves.

It has been argued that ICT can act as a facilitator of a swing to this type of teaching and learning, and that it can act as a catalyst for this change. This "catalytic effect" was anticipated in the Irish ICT strategy (1998).

Internationally there has been much consideration of the question of whether ICT encourages this more progressive education. The International Association for the Evaluation of Educational Achievement (IEA) Second IT in Education Study (SITES), examined this question in the context of the use of ICT in education in 26 countries.

The SITES study defined a series of characteristics that they considered to be related to "traditional education" and another series that were related to the "emerging paradigm" of student-centred work. Across all 26 countries, they examined whether high use of ICT was associated with more of the emerging paradigm values in teaching. The results however, were mixed. While the schools with high "emerging paradigm values" tended to have high ICT use, it did not follow that all schools with high ICT were high on these values. The study concluded, *inter alia*, that across all three educational levels, the "most satisfying experiences" with ICT involved the kind of student activity that might be "considered as innovative and related to the emerging paradigm."

At the same time a major OECD study developed case studies of the use of ICT in a series of countries with a view to asking whether ICT had a transformative effect on teaching. This study, in which Ireland participated, found that some schools where innovative practices occurred made heavy use of ICT, it did not necessarily follow that use of ICT always had the effect of driving innovation.

As in the major international studies, the *SchoolSat* schools revealed a variety of outcomes. In some cases, the use of the Internet encouraged project work and student-centred research work, as exemplified by the history projects in Glenties. There was some increase in use of project-based work, although also some didactic work. However, in other schools the Internet was used to support activities based on very conventional pedagogy (skoool.e.g.), or even on testing (my-etest).

This mixed outcome reinforces the view that ICT *per se* does not have a catalytic effect, but that it may act as a facilitator of change, subject to compatible teacher beliefs and other conditions.

In the case of *SchoolSat*, teachers' perception was that there were real learning benefits. The main benefit reported was increased motivation. Teachers doing project work also reported increases in the students taking responsibility for their own learning, and were pleased with the quality of work done. The teachers using online tests reported that they seemed particularly engaging to the weaker students, who were anxious to get back to increase their score.

One of the main conclusions of *SchoolSat* is that broadband Internet connectivity can facilitate greater use of the Internet in schools, particularly allowing whole class activities. The example of the nine schools demonstrates that the Internet can be used in valid educational ways within the constraints of Irish schools.

To go deeper into the discussion on possible gender patterns emerging from the use of ICT, some have suggested that the use of ICT in schools may be particularly attractive to boys, thus further enhancing the skill divide across society as a whole. In a U.S. study of undergraduate students' computer skills and usage, it was noted that overall skill levels rose between 1989 and 1997. However male students remained better skilled and more comfortable with the technology than girls (Schumacher & Morahan-Martin, 2001). A recent study of high-school students in Taiwan has also reported that boys showed a greater interest in ICT than girls (Tsai et al., 2001).

The kind of experience of ICT in school may be an important factor in developing girls' interest in ICT. In the Netherlands, for example, the strategy is not simply to ensure equal access for girls, but to take into account the "differences in interests and learning styles between students, so that ICT becomes more appealing for girls" (Brummelhuis et al., 2000).

Some have suggested that the kinds of ICT activity that may be done using the Internet may be more suitable for attracting girls to use ICT. In the UK for example, Mumtaz (2001) found that boys were more interested in playing games, while girls are more interested in e-mail and communication with friends.

In *SchoolSat*, most schools did not notice any gender pattern, but one school felt that boys seemed more interested than girls. It is possible that this indicates that the use of the Internet was sufficiently gender neutral to attract boys and girls equally in most schools. However, there is insufficient evidence to draw any significant conclusions, as teacher perception of gender pattern is notoriously inaccurate.

It would, therefore, be dangerous to conclude that simply providing broadband access would automatically lead to a growth in appropriate educational use of the Internet. Larry Cuban has pointed out the difficulties involved in making real change in schools. He argues that policy has often focused on the provision of the technology and infrastructure, and has resulted in disappointing results. He suggests that, far from the ideal of project-based teaching and learning advocated by the technology enthusiasts, the impact of ICT in schools has often been limited to some word processing and Internet searches. Real change, he suggests, will "have to address the ecology of schooling" (Cuban, 2001).

The *SchoolSat* schools also provided some insight into the *barriers* to Internet use within schools. Some of the teachers suggested that there should be more training for teachers, as they were afraid of the technology. This seems inconsistent with the reported pattern that the majority of teachers in these schools had home Internet access. In discussion, the teachers analysed this issue in more depth. They felt that "fear of the

technology" in this context does not mean that teachers are unable to browse the Internet, but rather that they are nervous of using it with a class. This nervousness may result from not knowing what to do with the Internet, or from fear of the classroom management and technical issues involved in using it with a large group. A similar pattern is found throughout the EU, where only 40% of teachers use the Internet in teaching, although over half have received ICT training and 70% have a home Internet connection (EU, 2003).

In discussion, the teachers also noted that innovation is difficult for teachers, as the examination papers do not reward the kinds of learning that might result from project work.

Access to the computer room was also a problem. Five of the schools identified access to the computer room as a barrier to use. Teachers reported that the room was always in use for computer classes, or not available at the times they had classes. In one case, use of the room was discouraged by the ICT co-ordinator, who did not like "others" in "his room." This, too, is a problem recognised in other areas. As Roberts argues, "Anyone who has ever been a teacher knows the inconvenience and interference with the educational mission when you have to schedule computer time in the library or the computer lab and the facilities fail to meet the needs of the class. The technology must be brought to where the students are learning and teaching [occurs]" (Roberts, 2000). In some schools the problem of access was simply a problem of capacity, in that there were no free times available in the computer room. In a few others, the difficulty was lack of support from management, as timetables could have been modified to allow access for curricular work.

FUTURE OF THE PROJECT

SchoolSat continued in Donegal despite the fact that that the funding from ESA ended in February 2003. The service to the schools taking part was provided in part through the direct support of NCTE and more recently with the partial support of Údarás na Gaeltachta. This support guaranteed the continuation of the Web-Sat service to the schools taking part until June 2004. In July 2004, the Irish Department of Education and Science launched a significant initiative to provide over 4,000 schools in Ireland with a broadband connection. Given the advantages and feasibility of satellite technology as proven in *SchoolSat* to meet the connectivity needs of rural and remote schools, it is estimated than more than 60% (Datanet, 2003) of these schools will require satellite connectivity of a similar type to that provided during *SchoolSat*. Roll-out is planned to begin in January 2005.

CONCLUSION

One thing remains clear, given the geographical spread of Irish schools (with more than half located in rural communities or towns of less than 10,000 people) and that is that satellite services remain the only viable way to offer broadband access to the Internet in the foreseeable future for many schools. While not cheap, the only way such services can be offered at an affordable price is for them to be offered on a reasonably centralised basis. Centralised purchasing and management has become increasingly popular with regard to ICT service for schools generally, hence the intention of the Irish Department of Education and Science to utilise HEAnet, the national Irish Higher education network provider to manage the forthcoming broadband schools service in Ireland[1]. Given the price of economic isolation and the need for balanced regional development, satellite technology offers a key opportunity to ensure that the schools' broadband service meets the needs of all Irish pupils and not just those in large cities.

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KEY TERMS

ADSL: Asymmetric Digital Subscriber Line is a technology for transmitting digital information at a high bandwidth on existing phone lines to homes and businesses. Unlike regular dial-up phone service, ADSL provides a continuously available, "always-on" connection. ADSL is asymmetric in that it uses most of the channel to transmit downstream to the user and only a small part to receive information from the user. ADSL simultaneously accommodates analogue (voice) information on the same line. (Source: http://www.whatis.com.)

Bandwidth: The amount of data per second that can be delivered to your computer. A 56K modem has a bandwidth of 56 kilobits/second. The term bandwidth is also used in conjunction with data rate when discussing video.

Broadband: Broadband is a new way of connecting to the Internet that will ensure rapid access, faster download times and a better overall performance such as high-resolution, graphics and CD-quality sound. Broadband connections are sometimes also called "fat pipes" due to the substantial amounts of data they can carry compared to more traditional "narrowband" connections, such as a modem which delivers variable service quality with slow download speeds. A broadband connection can be delivered in several different ways: Cable, DSL, Fixed wireless and satellite.

Download: To move a digital file (such as a media file) from a server where it is stored to a local system for viewing or editing.

Internet: A decentralised, global network. The World Wide Web is only a part of this network. Other components of the Internet include e-mail, news servers, Gopher and Telnet.

ISDN: ISDN stands for Integrated Services Digital Networks, a digital telephone/ telecommunications network which carries voice, data and video over existing telephone network infrastructure. It is designed to provide a single interface for hooking up a phone, fax machine, PC, etc.

LAN: Local Area Network.

ENDNOTE

[1] For more information about how this will be managed, see http://www.heanet.ie/services/services. php?serID=122&subID=34

Convergence of ICT and Culture

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INTRODUCTION

Participants in development projects and programs that strategically utilize information communication technologies (ICT) are engaged in activities that have culturally-relevant impacts. At local and regional levels, there may be approaches to implementing ICT-based development projects that are appropriately contextualized for different socio-cultural systems. Such approaches need to look beyond short-term outputs and mid-term outcomes and give adequate focus on long-term impacts. It is possible to analyze the long-term impacts of ICT-based development projects through a number of different lenses, one of which is the concept of "convergence."

The basic idea of "convergence" is the phenomenon of different states of being becoming one. Certainly the concept of culture converging with technology is not new; however, what is new with the convergence of ICT and culture is the accelerating pace of change on regional and international systems. This article describes diverse perspectives of "convergence" that may help provoke thought about and possibly inform the successful application of ICT for regional and international sustainable development.

Leveraging ICT to achieve socio-economic development goals is an approach that warrants reflection on the convergence of technologies and cultures. Awareness of the interactive dynamics between culture and technology can enable leaders, researchers, innovators, practitioners, and stakeholders to be more successful in facilitating sustainable "ICT for development" programs. Three views of convergence provide insight on the possible implications of "ICT for development" programs include: structural, technological, and cultural.

STRUCTURAL CONVERGENCE

From a historical perspective, the concept of structural convergence describes the phenomenon where societies in less-developed countries (LDCs) assimilate the processes and practices of more developed countries through technological transfers (Inkeles, 1998). This is often made possible through aid-funded projects in sectors such as agriculture, education, finance, transportation, and communications. In this perspective, convergence is normally non-reciprocal, meaning that the transfer of technology is unidirectional and only the recipient is impacted. This type of convergence involves the establishment of social and economic structures that are designed by and for developed nations. As evidenced throughout the 1900s, societal structures in LDCs such as finance, agriculture, education, government, and so forth, have become more similar to those structures found in developed countries (Aghion, Howitt, & Mayer-Foulkes, 2004). This structural convergence has a direct result on cultural content. Also seen during the previous century were numerous development projects in LDC's as well as developing countries that failed to produce intended results due to an inadequate consideration of the local environment, political reality, and culture (Howe & Dixon, 1993). Informed by lessons learned by others, current and future ICT-based development projects that affect the processes and practices in developing regions may be able to shape the impact of structural convergence to be more appropriate for a given socio-cultural system and perhaps increase its chance for success (Moore, 1998).

TECHNOLOGICAL CONVERGENCE

Distinct from the structural view, the "technological convergence" perspective describes a phenomenon where technological systems come together to create new systems. A widely recognized example of this type of convergence is the Internet where computers are interlinked using new and existing network infrastructures along with packet switching protocols (OECD, 1996). The World Wide Web (WWW), an aspect of the Internet, is a further example of convergence in that the digitally-mediated GUI environment of cyberspace has been merged with activities normally conducted in specific physical locales (i.e., shopping, banking, learning, working, etc.). A narrower example of this type of convergence is Voice over Internet Protocol (VoIP), which has the potential to significantly influence the future structure of global telecommunications.

Driven by the acceleration of diverse technologies being synthesized into new technologies, the phenomenon of "convergence of technologies" is pressuring the privatization and liberalization of laws, policies, markets, and economies (Blackman, 1998). Similar to structural

convergence, the spread of technology is creating cultural impacts that affect the recipient's culture more than the culture in which the technology was developed. Participants in "ICT for development" programs should be cognizant of this dynamic.

CULTURAL CONVERGENCE

Structural and technological convergences explain aspects of globalization and clearly represent a powerful influence on socio-cultural systems. Perhaps both an influence and an impact to technological convergence, "cultural convergence" is a constantly changing dynamic that serves as an engine for the evolution of broad social domains such as language, values, beliefs, behavior, and artifact. The process of cultural convergence reflects how culture changes through intra- and inter-cultural interactions. Some observers note that the quickening pace of convergence in ICT and the digital tsunami of media content may be detrimental to the integrity of the recipient's culture.

CONVERGENCE OF ICT AND CULTURE

Attempting to understand the convergence of ICT and culture is messy but imperative to the effectiveness and sustainability of development activities. As mentioned earlier, neither the convergence of culture and technology nor awareness of the phenomenon is new. What makes the convergence of ICT and culture notable today is the speed at which these technologies have (and will likely continue to) spread and impact ICT can have on all social systems. The diversity in views of convergence clearly pertains to how ICT is used for development and may account for the difference in how "ICT for development" programs are perceived by stakeholders and "donor" and "recipient" populations.

Given the nature of technological convergence, it might appear as if LDCs are bound to be subjected to cultural change determined by external cultural forces (Huntington, 1993). Indeed, this asymmetric phenomenon can be seen in television programming, WWW content, software licensing, and the establishment of technological standards (Foulger, 2002). Because convergence is complex and causes unintended consequences, some perceive that cultural imperialism is a malignant by-product of development efforts based on technological transfer (James, 2003). However, it may be more than a by-product; it may be a direct result of trends set in motion by historical oppression and subjugation compounded

by economic inequities (Senghaas, 2002). It is not exactly a coincidence that most LDCs are former colonies and perhaps understandable why citizens in the post-colonial developing world are much more sensitive to the issue of cultural imperialism than are citizens from more developed countries. Donors, practitioners, and stakeholders in initiatives that leverage ICT for social and economic development are necessarily involved in a process of technological and cultural convergence. This process does not have to include side effects such as hegemony and cultural homogenization. There is some control in the design, organization, degree of inclusion, implementation, and assessments of "ICT for development" programs that can balance the realities of convergence with the imperative of promoting cultural integrity. Due to the converging forces of globalism, there is probably no way to avoid the impact of ICT on culture; as some say, "the genie is out of the bottle." However, through adequate awareness of long-term impacts, a degree of control may be possible. For those involved in the design and implementation of ICT-based development projects that are aimed at either local or regional levels, they should take care to find effective ways in shaping the impact of ICT on the recipient social systems to be appropriate and beneficial. Careful implementation of convergence is not only an important condition to sustainable socio-economic development; it is consistent with the fundamental objective of any development activity to help bring about beneficial change while minimizing harm.

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KEY TERMS

Convergence: The process of coming together or the state of having come together toward a common point.

Culture: Integrated system of spiritual, material, intellectual and emotional features of society or a social group that encompasses, among other things, art and literature, lifestyles, ways of living together, value systems, traditions and beliefs and artefacts.

ICT-Based Development Projects: Development projects the employ information communication technologies as a strategic tool or approach for achieving desired outcomes.

Information Communication Technology: The technology required for information processing. In particular, the use of electronic computers and computer software to convert, store, process, transmit, and retrieve information.

Critical Mass and Self–Sustaining Activity

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INTRODUCTION

Recent studies of community networks (CNs) have provided optimistic views of the potential of information and communication technology (ICT) to support and enhance community life in various ways, in a variety of urban settings (di Maggio, Hargittai, Neuman & Robinson, 2004; Hampton & Wellman, 2001; Kavanaugh & Patterson, 2001). Consequently, there is growing interest from the community sector and ICT professionals in facilitating the social appropriation of ICT, and a growing interest from academics in the performance and evaluation of CN technologies.

There are clearly many difficulties for community sector and IT practitioners in implementing a CN, and many complications for academics in understanding the nuances and implications of CN performance. One such difficulty is the extent of adoption and use of the CN, such that the interaction it supports becomes self-sustaining. Achieving a self-sustaining level of activity is obviously a key indicator that a network has been appropriated by a community, but is not as straightforward to achieve or to understand as it may at first seem. In this article, we use *critical mass* as a metaphor to explicate the contributing factors that underpin self-sustaining levels of CN activity. Critical mass and the sustainability of a CN are addressed through a case study of an Australian residential CN called *The Range*.

CRITICAL MASS

Many formalisms, theories and models have migrated from the Natural Sciences to take on new life in the Humanities. This reliance on nature to provide an explanation of society is sometimes literal (e.g., evolutionary psychology) but is more often metaphorical. Critical mass is a concept that has made this migration, and is now called upon to do explanatory work in the fields as diverse as software engineering, marketing, macroeco-

nomics and biology. The term was developed in nuclear physics to describe a situation in which a chain reaction is self-sustaining. In this case study, we use critical mass as a generative metaphor, rather than as a proximate cause, to understand the conditions under which participation in a CN might become self-sustaining.

The factors that contribute to self-sustaining atomic chain reactions are now well-known (though not easily achieved) and have been established empirically and theoretically through decades of experimental work, modelling, and abstraction from first principles. These factors include the mass of fissionable material available to the reaction, the shape of that material, its purity, its initial density, the geometry of the material's casing, and the casing's performance in absorbing or reflecting neutrinos.

The factors that contribute to self-sustaining CNs are not well-known, and have not been established empirically or theoretically (Arnold, Gibbs & Wright, 2003). In a small move to redress this situation, we identify five factors that have contributed to low adoption rates of The Range. These factors are:

a. The aggregation of users and of content;
b. The affordances of networking technology;
c. The shape of community and its relations;
d. The response to community engineering; and
e. The recognition of the technology.

Each of these factors offers a partial account for the low uptake of The Range, and we speculate that these same factors are also implicated in CNs that have achieved self-sustaining levels of activity (Arnold et al., 2003).

THE RANGE

Williams Bay is a housing development of 51 houses. It is part of a relatively new housing estate of several

hundred dwellings called The Rifle Range in northern Williamstown, an old, well-established, affluent suburb of Melbourne, Australia.

In 1998, The Stonehenge Group won a government tender to purchase and develop the Williams Bay parcel of land. Important in their bid for the land was a vision that ICT would play an increasingly prominent role in Australian residential and community development. Acting on this vision, Stonehenge developed and implemented The Range, a CN for the residents of Williams Bay and, shortly after, the whole of The Rifle Range estate.

On the face of it, there were good reasons to be optimistic about The Range's prospects for success (Arnold, 2003). The residents of the neighbourhood were generally well-educated, middle-class and typically had professional careers as "symbolic analysts" (Reich, 1991) and should have been "natural matches for online communities" (Rheingold, 2000, p. 46). In addition, Williams Bay was advertised and sold, in part, on the basis of the technology. Residents indicated on numerous occasions that community relations were important to them, and they expressed a generally positive view of the role The Range could play in fostering their local community. The property developer played the role of "product champions" (Rogers, 2003) and made concerted effort to promote, maintain and subsidize the technology. Finally, while Williams Bay and The Rifle Range are new housing developments, they are located within a suburb with a strong history of community interaction and identity. In all of the earlier mentioned, The Range fulfilled many criteria for successful community development using ICT (Pigg, 2001).

However, after nearly two years of operation, the online responses from residents to The Range were disappointing: interactions were concentrated among a handful of residents and traffic volumes were low and decreasing. Residents had taken few initiatives to commence online discussions, post announcements, form groups, and establish their own newsletters. Most of the functional capacity of the system remained unutilized, especially the capacity for residents to customize and shape the system to suit their own purposes. As 2003 ended, The Range, as a CN, was not self-sustaining.

ACCOUNTING FOR RATES OF ADOPTION

Our research indicates that five factors contributed to sub-critical levels of activity. These factors are discussed in the following sections.

The Network's Aggregation of Users and Content

A self-sustaining nuclear reaction cannot occur without a certain quantity of radioactive material, of certain purity, amassed in a certain concentration. Similarly, a self-sustaining CN cannot occur without a certain quantity of participation, and a certain quality of content, brought together on the site in a certain concentration. To bring together the requisite mass of participation, quality of experience, and concentrations of activity, The Range interpolates its community in geographic terms, defined by a boundary.

If the boundary is too large, quantities of network activity may also be large, but the "purity" of the CN may be lost. Two possibilities flow from this. Firstly, the larger scale of the network may lead to greater, total levels of participation, but an aggregation of people that is too disparate and diverse dilutes the "quality" of the network activity for all, and participation may decline to sub-critical levels over time. Secondly, the large but diverse aggregation may fracture into smaller, more cohesive clusters. More will be said about this shortly.

Alternatively, if the boundaries of the CN are drawn too tightly, the network will have severe difficulty in attaining and then maintaining the energy levels required to keep the site active, regardless of its purity. This problem was recognised early by Stonehenge when they expanded the "community catchment" zone from the 51 houses of Williams Bay, to the Rifle Range's several hundred adjoining households, then later to include the whole suburb of Williamstown.

At the time of writing, membership of The Range is steadily increasing, but an increase in the aggregate of potential participants is only part of the story. Key community groups—such as local scout troops, churches, schools, the police and sporting clubs–have been actively pursued and enrolled in the network. Over many decades, these community groups have developed strategies to bring and hold together their respective members. By drawing on these experienced and expert community networkers, The Range is increasing its quality, as well as its mass, and the interpolation of "community" by The Range now more closely follows the natural fault lines or contours of the community.

Determining where these contours lie can be very difficult. People living in the same district group and regroup in shifting aggregations on the grounds of locale, personal subjectivities, family traditions, perceived objective interests, occupation, gender, religious practice, socio-economic status, ethnicity, and so on. Self-sustaining community groups are able to reach into

these groups, and might bridge across them. A CN is a structured artefact that constitutes its own aggregations, firstly by including and excluding participation at the network firewall, and then by structuring content, activity, and functionality within the site. Having cast a wide net to allow for all of Williamstown to participate, the trick to sustaining critical mass is to encourage and enable self-organized aggregations of activity that reflect Williamstown's social contours.

Modes of Communication Afforded by Network Technology

As an example of CN software, The Range is state-of-the-art. It is easy to use, robust, customisable, and provides a comprehensive range of functions. All of the convenience and possibilities for communication made available in "the space of flows" (Castells, 1997, 2001) are available through The Range. However, if a CN is to be self-sustaining, the media-form that it employs must be perceived as appropriate for the purpose. That is, the Internet (as a media) as well as The Range (as an Internet application), must each be convivial (Illich, 1973) for community networking.

There is on going controversy concerning the social conviviality of the Internet, and many have drawn dystopian conclusions. Use of a CN is unfavourably contrasted with the kind of interaction one might find on a Williamstown street corner. This kind of social interaction is banal, casual, spontaneous, and ephemeral. Its social significance, and its importance in producing social capital through weak links (Putnam, 2000), is not diminished by the shallowness of the content. Small talk is the important stuff of routine social connection, but is it the stuff we want to sign our names to on a CN, and have posted in a public place available to all of our neighbours for an indeterminate period of time? A lack of spontaneity in online interactions may also be a factor. To go to one's computer, boot-up, connect to the Internet, navigate to the CN, log-on, read the postings, compose a new posting, then hit the submit button, is not an act of spontaneous happenstance. To then be publicly associated with the posting, accountable for it, and known to many other people by these postings, all requires a degree of deliberation that cuts across the very character of weak links and neighbourly small talk.

These factors work against the establishment of private discourse between individuals, and limit the opportunity in the online environment for engaging in community building activities, such as gossip and ephemeral banter. The abstract "calculative" nature of text as a communication media and the structured, arboreal and hierarchical arrangement of postings are also factors

that seem to work against the technology of The Range being a convivial mode for the expression of neighbourhood community ties.

The Shape of Community and its Relations

Just as there is controversy over the social conviviality of the Internet as a media form, there is also controversy over the location and shape of community. The Range makes its call to community on the basis that community is in some fundamental sense located in Williamstown. While support is widespread for the view that place, propinquity or locale remain significant contingencies in the conduct of social, economic and community relations, this is by no means beyond dispute. An alternative construction of the location of community draws upon a different ontology, does not locate it in any particular place, and does not bound it in any particular way, but regards it as an extensive, ramified, and fluid network of interrelating individuals. In this ontology of community, social relations between non-intimates are private assets, built and maintained by individuals to serve their particular assemblage of social interests (Wellman, 1988). These geographically extensive, ego-based social networks bear little relation to Tönnes' *Gemeinschaft*, and are not rooted in shared place. It seems that The Range's early interpolation of community as primarily located in geographically defined neighbourhoods diverged from the social interactions and dependencies of its putative members.

Response to Community Engineering

Community is imminent in human relations. In this sense, it is an organic autopoiesis, building enduring structure out of the flow of social performance. The Range, on the other hand, is an engineered artefact, built for robust functionality and only, after the fact, populated with performance. Community encounters The Range in an attempt to engineer the organic, based on the administrative ordering of nature and society, and founded on a high-modernist ideology. Nature can be ordered and improved; community can be facilitated. The Range orders community in a rational and instrumental way, drawing upon best practice in interface design and Web site architecture to facilitate and shape the performance of community interaction. All of the above elements are present in Scott's (1998) account of the logic behind failed social engineering schemes in the last century.

CNs like The Range are engineered, and studies of community response to these systems need to account

for possible resistance to these initiatives to engineer community relations. In the case of The Range, resistance was passive; a form of benign neglect. There have been no direct actions against The Range, nor have there been negative responses during interviews with potential members. Rather, resistance is enacted through public ambivalence and the continuance of everyday life around The Range rather than through it (Bauer, 1995). While residents are unwilling to naysay the notion of community and the CN, The Range remains a curiosity. It is something not found within *normal* life and *normal* neighbourly relations. The Range has been established from the top-down, while more *natural* communities are emergent phenomena and develop, as it were, bottom-up. Resistance to The Range cannot be explained away as technophobia. Rather, it stems from a mismatch between the way this community acts, and the way in which this same community is technologically hosted and represented online.

Domestication and Recognition of the Technology

Domestication is a form of social learning, in which users find a way to incorporate an introduced technology into their lives (Williams, Slack & Stewart, 2000). An early and necessary stage of domestication is to recognise a new technology, often through a metaphor or an analogy that acts to place it in a more familiar context—a computer desktop for example. Since the creation of The Range, Stonehenge has actively tried to familiarise residents with the CN through a series of social functions, demonstrations and pamphlet distribution, in which the features and the benefits of the system have been promoted. What The Range *has*, and what The Range *does* has been thoroughly explained. What The Range *is* however, has been all but neglected. When the developers present The Range to residents, their approach is one of *features* and *functionality*, and not one of *identification*. While this may be interesting to potential users, the information is almost useless unless they have somewhere to metaphorically or culturally place this information. The technology of The Range is *domesticated* and *familiar* for the developers, yet remains *wild* and *elusive* for the residents. From a residents' perspective, The Range has function without purpose, and is a solution without a problem. This ontological misalignment between resident and developer creates a chasm of misunderstanding that must be addressed before recognition and domestication can occur.

Figure 1. Critical Participation Model (CPM)
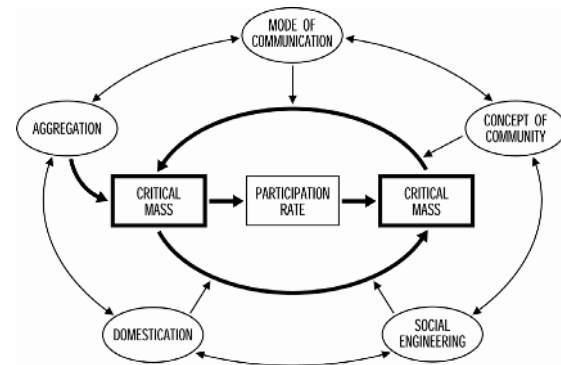
FUTURE RESEARCH

To date, the factors that contribute to a self-sustaining CN have not been established empirically or theoretically. Critical mass is often used to describe the threshold, minimum level of activity, or participation, at which a CN will become self-sustaining. However, the participation levels at which this threshold is reached will vary, depending on local contingencies and the particularities of the CN concerned. Determining the factors that contribute to self-sustaining levels of participation is a fertile topic for ongoing CN research.

CONCLUSION

In this article, we have identified five factors that contributed to CN participation rates in a particular case. We believe that these factors, among others, will be important in other cases. We represent the relationship between these five factors in the Critical Participation Model (CPM) depicted in Figure 1.

The CPM depicts our interpretation of the interplay between the five influencing factors, participation rates and critical mass. The relationship between participation rates and critical mass is central in the model and can be likened to a self-fuelling virtuous loop of upwardly spiralling participation rates when critical mass is achieved, and a self-fuelling degenerative loop of downwardly spiralling participation rates when short of critical mass. If critical mass is never achieved, the loop may lock-in sporadic or negligible participation rates. In our case study, while the absence of critical mass provides a theoretical account for the low participation

rate, the low participation rate provides the empirical evidence by which an *a priori* judgment is made about critical mass. In essence, a quantum threshold is theorized, and participation rates are placed in relation to that threshold.

Different CNs will display different characteristics and operate within different environments, meaning that the relative influence of each of the five factors will vary, and other factors may come into play. In the particular case of The Range, we have formed the opinion that although all five factors contribute, inappropriate aggregation contributed the most because aggregation of users was far from optimal.

The double-headed arrows in Figure 1 indicate that in addition to their influence on the critical mass spiral, each of the five factors contributes to the constitution of the others. For example, the boundaries of inclusion and exclusion that define the characteristics of aggregation are reflected in the mode of communication (decisions made about who can do what on the CN), which in turn informs a concept of what a community is, which flows through to a recognition of an attempt to engineer a set of community practices and an inclination to embrace or resist that attempt, which ultimately implies inadequate recognition and domestication of the technology.

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KEY TERMS

Aggregation: Metaphorical boundaries that indicate a community network's zones of inclusion and exclusion, and structures of content, activity, and functionality within the site.

Community Network (traditional): A sociological concept that describes the rich Web of communications and relationships in a community.

Community Networking (technology): Computer-based, ICT intended to support community relationships.

Critical Mass (socio-technical definition): The minimal number of adopters of an interactive innovation for the ongoing rate of adoption to be self-sustaining.

Critical Mass (as a metaphor): A generative metaphor derived from the natural sciences (in particular nuclear physics) that describe a situation in which a chain reaction is self-sustaining. This metaphor acts as an aide, rather than a proximal cause, to assist the identification of contributing factors in humanities-based case studies.

Domestication of Technology: Social learning through which users incorporate an introduced technology into their lives by a process of negotiation and translation, practical activity, and the utilization of local knowledge.

Passive Social Resistance: Ambivalence to an introduced technology due to poor technology-life fit, or ontologically unrecognisable technology, evident in the unchanged continuance of everyday actions by intended users.

C

Crossing the Digital Divide and Putting ICT to Work to Improve People's Lives

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INTRODUCTION

Information and communications technology (ICT) is a key weapon in the war against world poverty. When used effectively, it offers huge potential to empower people in developing countries to overcome development obstacles, address the most important social problems they face, and strengthen communities, democratic institutions, a free press, and local economies. But, a "digital divide" separates those who can access and use ICT to gain these benefits, and those who do not have access to technology or cannot use it for one reason or another.

Governments can play a fundamental role in creating an environment that will foster technology use and encourage investment in ICT infrastructure, development, and a skilled workforce. Government action is also important in spreading the benefits of technology throughout society, and governments have the power and mandate to balance the needs of their citizens for long-term economic growth and social prosperity. However, translating a vision into practical steps that fit the local context is not a simple matter. Leaders need to have a realistic appreciation for what ICT can—and cannot—do for their countries and communities, and they must lead effectively and bolster public confidence in the path they take.

The digital divide is a complex problem, presenting both practical and policy challenges. And it is apparent that solutions, which work in developed countries, cannot simply be transplanted to developing country environments: solutions must be based on an understanding of local needs and conditions.

GOVERNMENT POLICY CAN HINDER EFFORTS TO TACKLE DIGITAL DIVIDES

A range of projects are underway in developing countries to integrate ICT in a number of critical areas, including education, healthcare, government, trade, and small business support. However, these projects frequently encounter obstacles that directly or indirectly relate to the country's policy environment. One example involves projects that rely on technology or infrastructure use that is limited by current laws or regulations, such as laws that control or ban the use of satellite, wireless, or Voice over Internet Protocol (VoIP) technologies. Another example involves ICT projects that are hindered by a general law or regulation, such as fiscal or customs policies that limit cross-border trade in computing technologies. Another involves projects working in a particular subject area (such as healthcare) where current laws or regulations do not cover ICT use (such as privacy and data protection laws governing the handling of electronic health data).

To cross the digital divide and put ICT to effective use to improve people's lives, countries and communities must be "e-ready" in terms of infrastructure, access to ICT, training, and a legal and regulatory framework that will foster ICT use. If the digital divide is to be narrowed, these issues must be addressed in a coherent, achievable strategy that is tailored to meet local needs.

Many national leaders have embraced ICT and are ready to promote a legal and regulatory environment that will enable its widespread use. However, at the working level, many government officials do not understand the implications of existing policies that may hinder ICT use, nor the changes they need to create a more favourable environment. Although the development aid industry generates a tremendous volume of reports, advice, and analysis aimed at helping developing countries in the policy area, developing country governments frequently report that such recommendations do not show sufficient understanding of local needs and conditions. Some governments have subscribed to e-strategies promulgated by outsiders, but at a practical level they lack the political will to drive change because they do not enjoy widespread public support for an ICT-focused approach. Often this is because government officials fail to engage stakeholders in framing the e-strategies, so they do not have public buy-in for their long-term plans. In some cases the government has partnered with the country's business and civil society sectors to promote ICT-enabled development at the ground level, but the various stakeholder groups lack the experience and resources to give effective input.

CITY OF CAPE TOWN: AN EXAMPLE OF BEST PRACTICE AT CITY LEVEL

Many of the policy issues related to ICT use are at the national level and include issues such as legal and regulatory frameworks and macro-economic policies. But there are other issues where city governments have a key role to play.

The City of Cape Town is an example of a local government committed to putting ICT to work for social and economic development, and driving the changes necessary to ensure ICT is used effectively. Cape Town's leaders have recognised that ICT is a powerful tool for transforming the way that people do business, communicate with each other, access information and, if used effectively, can help the City achieve its goals.

In January 2002, the City Council commissioned *Bridges.org* to undertake a pioneering assessment of the digital divide in Cape Town, in order to get a view of where its citizens, communities, and organisations stood in terms of current ICT use and the potential benefits of ICT use in the City. The study examined the access, use, and need for ICT in Cape Town, with a special focus on the millions of people who live in disadvantaged communities within the greater metropolitan area. The study helped City leaders to measure ICT integration, plan for expansion, focus their internal efforts, and to identify areas where external support was required. The study also provided benchmarks for external comparison and gauging internal progress. Finally, the study served as a valuable part of a greater process to bring a wide range of stakeholders into the discussion about ICT and development in Cape Town.

National-level assessments of this nature commonly study e-readiness by compiling information from government agencies, big companies, business associations, and other secondary sources. This study started with such an approach. However, it then went further to collect direct input from communities, small businesses, and community organisations, to gauge the need for ICT service in the community and depict the real-life constraints—and opportunities—that people and institutions face as they work to harness ICT for local benefit.

At the same time, the study assessed the interest and capacity of the City's communities, businesses, academic institutions, and government agencies to help '*bridge the divide*'. Such an approach allowed this study to look ahead to the social appropriation of ICT for local benefit, so that practical options and recommendations could be framed to guide the City Council as it developed its own plans. Further, the processes used in the study helped the City better connect with its people and to gain widespread support for the e-strategies the process developed.

As a result, several public and private sector initiatives commenced in Cape Town with the related goals of (1) fostering the budding ICT sector and using ICT as an enabler for broader economic growth, and (2) tackling the problems of the "*digital divide*" to maximise digital inclusion. Perhaps the most notable example was the City of Cape Town's Smart City Strategy, which won the African ICT Achievers Award for e-Government in 2002. This strategy aimed to put ICT to work in ways that would enable the government to transform itself to deliver more effective and efficient service to citizens. It also aimed to empower citizens to deal more effectively with the growing digital economy. The city envisions "a smart city populated by informed people, connected to the world and each other by the technology of the information age."

ABOUT BRIDGES.ORG

Bridges.org (http://www.bridges.org) is an international non-profit organisation based in South Africa with a mission to promote the effective use of ICT in developing countries to improve people's lives. One area of focus is in informing policy decisions that affect people's access to and use of ICT. *Bridges.org* also conducts technology research and provides social consulting services to ground level projects using ICT, helping with project planning and evaluation and relaying lessons learned. It brings an entrepreneurial attitude to its social mission, and is committed to working with, instead of against, government agencies and the business community.

Cultural Barriers of Human–Computer Interaction

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INTRODUCTION

Information and Communication Technology (ICT) researchers and practitioners are well aware of the cultural challenges brought on by a global market (Smith, 2004; Smith, Dunckley, French, Minocha, & Chang, 2004). However, there are many unresolved problems concerning the extent to which culture influences ICT usability. Businesses use ICT in the form of databases to house customer information, Web sites enabling customers to place orders, information systems for management or suppliers, training systems, and as products sold to customers. Internet growth enables businesses to expand their customer base to international markets. Thus, businesses benefit from the explosion of Internet usage but may be challenged by how to best meet the needs of their multi-cultural customers, suppliers, and employees. There is a need to develop a model of cultural barriers to human-computer interaction (HCI). With all of the technology in use today, along with the different cultures that interact with ICT, it is important to identify a model of ICT and the HCI barriers produced by it to better help designers of ICT avoid these technology pitfalls. Figure 1 displays how the incorporation of technology, people, and culture into businesses must be carefully positioned together to optimize the success of all involved.

This article examines cultural barriers to HCI and outlines a model to help designers of ICT avoid these barriers so as to enhance a company's ability to conduct business internally and with international businesses and customers. The article addresses topics of interest to ICT practitioners and researchers alike. Current services available to businesses that support effective international HCI are discussed. Current research and future research opportunities in the field of international HCI in ICT are also examined.

BACKGROUND

It is important to define HCI as the study of human behavior in interacting with any computer-based device such as a Web page, information system, or other technology. Through the study of HCI, researchers optimize interactions between the human and technology through better design of the ICT. Traditional ways of conducting business seldom exist in a society experiencing growth in the Internet, globalization of trade, and digital integration internal and external to a company. The role of ICT including e-commerce and information systems has become more complex as businesses continue expansions into global markets (Laudon & Laudon, 2004). With businesses having multi-cultural customers, suppliers, and employers, there are demands for businesses to utilize ICT that adequately meets the needs of cultural groups that interact with the technology. This section discusses how international HCI is an important aspect of ICT. In fact, there are businesses that specialize only in servicing other businesses in providing multi-cultural aspects to ICT. Furthermore, current research in the field of HCI is addressed to uncover cultural barriers to HCI that potentially produce ineffective ICT for specific user communities.

Today, HCI is in the spotlight as companies outsource software development or Web sites, operate e-commerce businesses, and extend their services to international customers. The globalization of business has pushed industry into finding ways to incorporate international HCI. Usability is a topic under the umbrella of HCI that is important to design into any ICT, especially systems utilized by a multitude of international users. Zwick and Dholakia (2004) suggest that adoption of any ICT brings about multiple issues to consider regarding social, politi-

Figure 1. Core components for international businesses
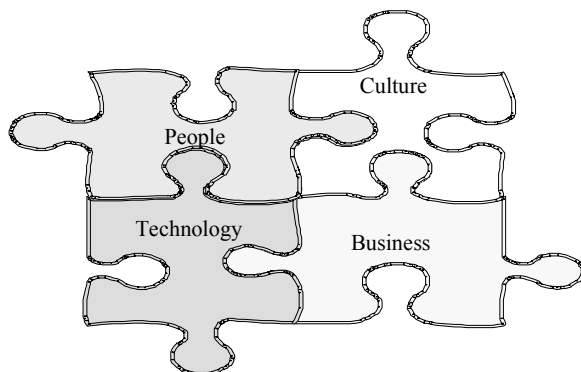
cal, economic, and cultural implications. ICT such as Web sites are generally adopted to solve a business need, but this article also suggests that with the introduction of technology, businesses may inherit new challenges before achieving full resolution of their business need. With the globalization of businesses, cultural barriers must be identified and corrected in ICT-enabling companies to continue relationships with different cultural groups within their customers, employees, and suppliers.

There are ICT practitioners dedicated to servicing businesses to support effective international HCI. Current services available to support multi-cultural HCI business needs consist of companies that provide written translations, verbal interpretations, multilingual desktop publishing, audiovisuals, Web site localization, globalization consulting, language services, global branding support, content development, end-user experience designs, translation of business correspondence, international user research, usability testing, etc. Aplomb Translations (2004) is an example of a company that specializes in providing multi-cultural language services. Aplomb focuses on audio and video transcription, subtitling, voice-overs, and Web site translation. Another company, ABC Translations (2004), focuses on services such as Web site and software localization. Web site localization assists a company with services such as providing multilingual online marketing strategies to globalization-friendly sites. Software localization uses in-country specialists to create localized versions of software applications to serve specific cultural user communities. Crosscultural (2004) provides global online marketing, helping companies expand their Internet presence into different cultural communities. The expansion into global markets creates open doors for practitioners and researchers providing services and solutions that help businesses to better meet the demands of multi-cultural customers, suppliers, and employees through effective international HCI in ICT.

Research has been performed in the field of HCI and the subtopic of international HCI has increasing popularity with the globalization of business. Cultural barriers to verbal communication between individuals from even different English-speaking countries can be difficult (Norman, 1999). Barriers to international HCI are therefore concerned with not only language but also other factors as well. Heldal, Sjøvold, and Heldal (2004) suggest that a user's perception of a Web site will vary from culture to culture and is influenced by every aspect of a site, even beyond content and language. This experiment focused on evaluating Web sites using subjects from Norway and South-Europe. Aspects of a site such as site organization, frustration and innovation were rated differently by the Norwegian participants than the South-European partici-

pants. These findings suggest that differences in perceptions or impressions of a site can be related more to culture than the actual design of a site. An experiment conducted by Siala, O'Keefe, and Hone (2004) indicates that individual religious backgrounds may also affect online trust towards electronic commerce. They found that people and communities of people sharing common values and personality traits from different cultural groups can build in-group trust (Siala et al., 2004). The study compared individual responses based on their religious affiliation (Christian, Muslim, etc.), gender, and ethnicity. The study measured the extent to which religion and possibly in-group trust affects a participant's buying habits and inclinations to buy online from within a religious group. Findings indicate that religious backgrounds did make a difference as some participants appeared to be more consumer religio-centric. Trust and attitude in a Web-based retailer varies within cultural groups and increases the importance of businesses identifying with different cultural groups where trust and attitude affect buyer behavior (Siala et al., 2004). Another study by Cannon and Perrault (1999) suggests that satisfaction is important in relationship marketing, which is also linked to communicating proper and distinctive impressions. There are also interrelated aspects of these cultural barriers, as Heldal et al. (2004) suggest that poor usability of a site may give a customer a bad impression of the company and its products. These studies serve to demonstrate that international HCI is important in the design of effective ICT.

The term "usability" refers the capacity of software to easily and quickly perform the tasks that users seek (Dumas & Redish, 1999). Nielson (1993) further classifies usability as either practical or social acceptability. For the purposes of this article practical acceptability examines the usefulness of the ICT being able to carry out needed user functions. For example, if a person from England uses the search feature on an American Web site to find the term "organisation," the site should accommodate the language of the user even if it is not in the language of the designer of the site (i.e., Americans spell the term using a "z" instead of a "s" as in "organization"). Social acceptability refers to whether the technology is considered ethical within the purpose of the technology. This area is obviously complex and important since different cultures may have different impressions of ethics. Companies obviously should be interested in the effect of how pleasant a customer's online shopping experience is on sales. Furthermore, it is important that employees have very usable ICT systems because employees using difficult systems may spend longer performing set tasks and this could also impact morale and subsequently productivity.

Wickens (1992) developed a human-information-processing model that addresses the internal and external information processing that a human goes through in performing an information task. The model is useful in the application of ICT design of HCI issues as culture impacts the perception and interpretation of information. For example, if the language conversion feature on an online purchasing site is worded in English instead of having pictorial language indicators (such as flags), many users will have difficulty in understanding the site. More recent work by Te'eni and Sani-Kuperberg (2004) performed research extending the human–information-processing theory into the identification of Levels of Abstraction (LoA). LoA refers to the process of users getting lost in the details of information search. When users shift focus to reading the online help feature, they are switching from one level of abstraction to another. LoA research is a detailed task analysis of a user operating technology. If LoA can be generalized for specific cultural communities, it may also be useful in designing ICT for multi-cultural information processing and thus extend previous information processing research.

CULTURAL BARRIERS TO HCI

ICT was earlier described to include any computer-based device. For businesses, common ICT consists of customer relationship management databases, computer-supported collaboration, management information systems, Web sites, training tools, supply chain management systems, and technology produced or used by a company. The literature asserts that cultural barriers to adoption and effective use do exist and greatly vary from culture to culture (Heldal et al., 2004; Siala et al., 2004; Smith, 2004; Smith et al., 2004;

Zwick & Dholakia, 2004). The literature suggests that some of the common barriers that exist include poor organization, hard-to-use features (not user-friendly), frustration, confusion, non-usable features, trust, religion, ethics, and lack of satisfaction (Cannon & Perrault, 1999; Heldal et al., 2004; Nielson, 1993; Norman, 1999; Siala et al., 2004). If Nielson's (1993) earlier work is considered, new barriers not previously identified include religion, trust, and ethics. Figure 2 displays a model that shows the impact that cultural barriers have on ICT for a business. The negative consequences of the barriers that impact customers, businesses, employees, and suppliers are extracted from the literature and include poor impressions of a business, decline in sales, and company efficiency and productivity (Lazar, 2001; Heldal et al., 2004; Cannon & Perrault, 1999; Siala et al., 2004). In a world where businesses are under constant pressure and competition to attract customers, to maintain dedicated employees, and to develop innovative products, it is challenging for companies to devote the necessary time and attention that HCI demands in meeting multi-cultural needs to adequately optimize businesses, technology, and people. The model presented in Figure 2 aids designers of ICT in considering cultural barriers to HCI and its impact on businesses, employees, customers, and suppliers.

FUTURE TRENDS

Future research opportunities for ICT practitioners and researchers are discussed in this section. The current implications are that ICT will continue to grow and eventually pulse through every aspect of an individual's environment and the emerging field is in the social appro-

Figure 2. The impact of cultural barriers to HCI
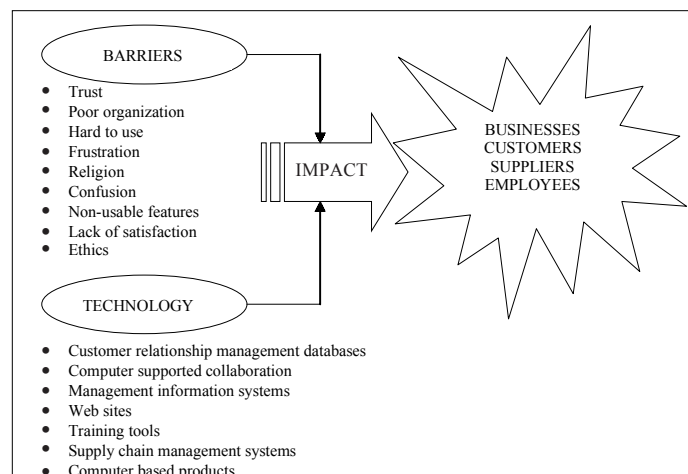
priation of ICT. The social appropriation of ICT brings with it an increasing need to view adoption from a users perspective in an environment of almost infinite choice. In such circumstances HCI will continue to be a significant part of the new and changing adaptations of ICT.

Obviously this will require increased effort on behalf of researchers and designers to define and mitigate barriers to ICT usability. Culture has been identified as a significant issue in the increasingly globalized world and follow-on research is required to validate the cultural barriers to the HCI model proposed. The next steps include the identification of guidelines that could be developed to design out cultural barriers to HCI addressing how to design ICT that is considered easy to use.

Luckin (2003) identified a checklist to help learners use multimedia. The checklist includes identification of the goal for using the technology, reminders of the goal, guide to sub-goals, and a model answer, thus providing feedback to the user for future use of the media. Given the increasing importance of social appropriation, research should be expanded to identify a checklist for use by designers of ICT to design out cultural barriers to HCI.

There is a need for research addressing the influence of animations on interaction with Web pages to measure the effectiveness of these interface enhancements (Schaik and Ling, 2004; Lee & Benbasat, 2003). This also presents an opportunity to identify the cultural preferences of such features. As Intranets also utilize such animations, research could be conducted to determine if productivity of employees is enhanced when such features are active. Furthermore, design teams could be studied to determine the successful incorporation of international HCI in ICT. Therefore, the effectiveness of multi-cultural design teams should be studied. Several researchers have explored international usability testing and have found challenges in the cost of operation across cultures as well as difficulty in communications between the usability professionals and users of different cultures (Dray, 2001; Murphy, 2001; Yeo, 2000, 2001).

As the world continues to push technology into global markets, a gap analysis effort could be performed to identify current and potential future needs of businesses versus current available services in terms of effective HCI in ICT.

CONCLUSION

The world has been revolutionized by the abundance of ICT that greatly transforms the way businesses and individuals communicate and operate. International HCI looks at ways that information displayed through ICT can be enhanced to optimize use in multi-cultural environ-

ments. While there is increasing recognition of the importance of the impact of culture on effective use of ICT in a rapidly globalized world, there is not a substantial body of research or practice that matches the expanding use of ICT. As ICT favours increasing economies of scale, business (both large and small) will drive the demand for answers to the impacts of culture on the social appropriation of ICT. This is of vital importance to regional business as it seeks to build interactions with particular regions across the world.

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KEY TERMS

Barriers to Human-Computer Interaction: Anything that poses as a challenge to a human interacting with technology. Examples include poor organization of a Web site and language conversion issues.

Consumer Religio-Centrism: Individuals who are so strongly committed to their specific religious group (Christian, Muslim, etc.) that their buying preferences consist of purchases from companies owned or operated by individuals with their same religious beliefs.

Customer Relationship Management: Technology in a business that houses information on customers. The information systems give businesses an integrated view of each customer that may consist of demographic data, buying trends, and financial data.

Enterprise Functions: Enterprise functions are composed of typical functions of a business such as human resources, marketing and sales, manufacturing, accounting and finance.

Human-Computer Interaction (HCI): Study of human behavior in interacting with any computer-based device. HCI is concerned with identifying ways to optimize such as through the design of technology and the relationship between humans and computers.

In-Group Trust: Communities of people that have similar beliefs, values, and personality traits induced by cultural forces and are more willing to identify members inside their group as trustworthy. Individuals within these communities obtain role models and opinion leaders within their group that influence individual's beliefs and behavior to include buying decision processes.

Information Processing: Study of how humans interact within their environment while interpreting information to identify a decision. Humans are a unique form of a machine and must process information in order to formulate a decision.

Management Information Systems: Systems utilized by management-level employees to seek information pertaining to the operations of their business. The information gives management insight into potential market or financial trends as well as the productivity and efficiency of their employees and equipment.

Supply Chain Management: Automates the relationship between businesses and their suppliers to optimize shared processes. An example of this relationship is suppliers through the Internet viewing supply levels of a

company and responding automatically through sending more supplies without the company directing the supplier to do so.

Usability: Study of the usefulness of technology as it relates to an individual being able to successfully perform their task with ease. Usability is measured through the ability of the technology to do the right job and to do the job right.

The Definition Dilemma of E–Commerce

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INTRODUCTION

There is confusion among researchers, practitioners and policymakers about the meaning of terms such as e-commerce, and small and medium enterprise (SME) (Krochmal, 1998; Mesenbourg, 2001; Poon, 2002; Xydias-Lobo & Jones, 2003). The lack of standard, universally adopted definitions presents a challenge to researchers and leads to inaccurate comparisons of rates of adoption. This article provides an analysis of various popular definitions of e-commerce and highlights the distinctions between them. A classification system is proposed and applied using examples of e-commerce transactions. Recommendations are provided which should prove helpful for researchers and practitioners interested in developing regional communities with information and communication technology.

BACKGROUND

E-Commerce is recognised as having the potential to contribute to national productivity, economic growth and welfare (Brown, 2002; Poon, 2002), and has been the subject of intense research efforts and conferences in the academic, industry and government arenas. In particular, regional business activities can benefit substantially from greater involvement in e-commerce (Brown, 2002). Rural SMEs also have much to gain from an effective engagement with e-commerce (Grimes, 2003). The Organisation for Economic Co-operation and Development (OECD) is developing policies to promote e-commerce as a core element to achieve sustainable economic growth, more and better jobs, expanding world trade and improved social conditions (OECD, n.d.). However, at the same time, the OECD recognises that the Internet alone will not improve the productivity and profitability of enterprises in developing countries as such firms may be hampered by weak infrastructure, limited managerial expertise and poor quality control (OECD, 2002a).

Recently, in writing a case study article, we encountered difficulties in deciding on a definition to use for the term e-commerce (Grist & Cater-Steel, 2003). It seemed that every information systems textbook and government report used a different definition, for example: "every type of business transaction in which the participants prepare or transact business or conduct their trade in goods and services electronically" (DCITA, 1999); or "the marketing, buying, and selling of products and services on the Internet" (Awad, 2002); or "the use of Internet technologies for internal business processes (intranet), for business relationships (extranet), and for the buying and selling of goods, services and information (Internet)" (OECD, 1998).

It comes then as no surprise that 41% of small business owners surveyed in New Zealand were unsure about what the e-commerce concept meant (Locke, 2000)! In Australia, a survey of 1,200 small and 600 medium businesses found that respondents understood e-commerce to mean a variety of things: "undertaking business online and conducting business on a global basis" (27%); "buying and selling over the internet" (26%); and "undertaking payments and ordering over the internet" (13%) (Yellow Pages, 2002).

The situation worsened when we examined data relating to adoption of e-commerce. We wanted to compare adoption rates over the last few years and also to compare the adoption of e-commerce in Australia with that of other countries, and regional adoption against metropolitan rates. E-commerce adoption figures released by the Australian Bureau of Statistics (ABS), as shown in Table 1, would include the case of a sole proprietor who uses Internet banking to BPay a telephone account. Other research, such as the Yellow Pages E-Business Report would not classify this type of transaction as e-commerce. Consequently, the comparison of adoption levels from different studies can lead to unreliable findings and questionable conclusions.

Some transactions are readily classified as e-commerce, for example the selection and payment of a book from Amazon.com. But if the owner of a small business pays the telephone account using an Internet banking bill payment facility, is that business engaging in e-commerce? A mobile phone can be used to purchase a Coca-

Table 1. Involvement of small business in e-commerce (ABS, n.d.)

Extent of ICT Use	Size	Nov. 1999		June 2001	
Involved in e-commerce	Non-employing	24,400	5%	76,300	12%
	1-4 employees	33,900	9%	86,800	22%
	5-19 employees	23,700	20%	47,100	37%
	Total Small Business	82,000	8%	210,200	18%

Cola drink from a vending machine at Sydney's Central Railway Station, or to pay for street parking in Melbourne or Dublin; are these examples of e-commerce transactions? These examples and others will be discussed after the definitions have been explored in the next section.

DEFINITIONS OF E-COMMERCE

There is no shortage of definitions for e-commerce. A search of the Internet using the Google search tool resulted in 882,000 hits for the search term "e-commerce definition". Close examination of various definitions showed that there are two dimensions to the term e-commerce stemming from the words *electronic* and *commerce*. There is wide variety in how these terms are interpreted within the context of e-commerce. Each of these terms can be interpreted in a broad or narrow sense.

In the United States of America in 1998, a National Science Foundation meeting attempted to reach agreement about the term e-commerce (Krochmal, 1998). The attendees included software developers and economists. Opinions varied with some believing e-commerce should be narrowly focused on transactions over computer networks; others saw Web-based commerce as a subset of e-commerce; and still other participants claimed it "includes everything from learning about products online and electronic transactions to online customer-service and support" (Krochmal, 1998).

The Commerce Dimension

Some definitions are restrictive in their interpretation of what constitutes *commerce*. For example, the United States Census Bureau have restricted the definition to focus on selling: "an e-commerce transaction is *completed* when agreement is reached between the buyer and seller online to transfer the ownership or rights to use goods or services" (Mesenbourg, 2001). Furthermore, they state that it is not the payment, but the online agreement which is the trigger for determining if a transaction is classified as e-commerce. All examples provided to support the Census Bureau definition include the words *sale* or *selling*.

In contrast, others include all activities associated with the commercial transaction, for example: "commercial activities carried out through electronic networks including the promotion, marketing, supply, order or delivery of goods or services" (Commonwealth Treasury, 2000).

The Electronic Dimension

Another source of divergence in the definition relates to the interpretation of the term *electronic*. Some authors restrict the definition to include only Internet-enabled transactions, for example "e-commerce: the use of the Internet and the Web to transact business, … digitally enabled commercial transactions between and among organizations and individuals" (Laudon & Traver, 2004). On the other hand, some authors, such as Roger Clarke, take a much broader view of the technology component: "the conduct of trading with the assistance of telecommunications and telecommunications-based tools" (Clarke, 2001a).

Within Australia, definitions used by the federal government take a broad view of the term *electronic* to include electronic networks (Commonwealth Treasury, 2000), in contrast to the Queensland State Government which defines e-commerce as Internet-based (QGDCILGPS, 2001).

To overcome such difficulties in defining the term, the OECD endorsed two definitions of e-commerce transactions: the broad definition includes all electronic transactions including Internet, electronic data interchange (EDI), and interactive telephone systems; and the narrow definition for Internet e-commerce transactions includes only transactions conducted over the Internet (OECD, 2002b).

In order to compare and contrast a range of definitions, a list of some popular definitions is presented in Table 2. It is not claimed that this list represents the most used or most useful definitions, but the list provides a sample to illustrate the vast range of definitions in use today.

The definitions presented in Table 2 have been analysed in terms of their interpretation of the terms *electronic* and *commerce* and placed in a grid repre-

Table 2. Sample definitions of e-commerce

Definition of E-Commerce	Author Reference
Buying and selling of goods and services on the Internet, especially the World Wide Web.	(Alexandrou, n.d.)
Selling online, with or through a Web site, or by means of e-mail.	(Ecommerce Digest, n.d.)
An Internet transaction is the sale or purchases of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over the Internet.	(OECD, 2002b) Narrow definition
An e-commerce transaction is completed when agreement is reached between the buyer and seller online to transfer the ownership or rights to use goods or services.	(Mesenbourg, 2001)
Either purchasing or selling activities that were conducted over the Internet.	(Yellow Pages, 2002)
Buying and selling products and services over the Internet, including: pre-sales activities such as marketing and brand awareness; the sales transaction itself (including fulfilment, inventory control, pricing, shipping/receiving); processing the payment; post-sales activities (e.g., warranty registration)	(Communication and Information Advisory Board, 1999)
Selling goods on the Internet, using Web pages. This involves much of the same processes as selling goods elsewhere, but in a digital format. Presentation, placement, display, stocking, selling and payment are all familiar concepts, e-commerce demands that all this be done on screen, and as an automated process.	(Web Design UK, n.d.)
Business that is conducted over the Internet using any of the applications that rely on the Internet, such as e-mail, instant messaging, shopping carts, Web services, UDDI, FTP, and EDI, among others.	(Webopedia, n.d.)
An electronic transaction is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks.	(OECD, 2002b) Broad definition
At its broadest, e-commerce is any type of business transaction or interaction in which the participants operate or transact business or conduct their trade electronically. Potentially, this could include activities such as the use of the telephone or the fax as well as the Internet. A broad definition would encompass EDI activities as well as more recent developments in electronic transactions.	(Allen Consulting Group, 2000)
The process of conducting all forms of business activity between entities using appropriate electronic methodologies and procedures in order to achieve the organisation's objectives. EC technologies embrace such widespread areas as all forms of electronic communication between enterprises, all forms of messaging, electronic trading, EDI, electronic banking, electronic mail, online services, electronic catalogues, multimedia communications, and video conferencing.	(Centre for Electronic Commerce, 1996)
Support services for trading in goods and services, encompassing inter-organisational e-mail; directories; trading support systems for commodities, products, customised products and custom-built goods and services; ordering and logistic support systems; settlement support systems; and management information and statistical reporting systems.	(Clarke, 2001b)
Commercial activities carried out through electronic networks including the promotion, marketing, supply, order or delivery of goods or services.	(Commonwealth Treasury, 2000)
The conduct of a financial transaction by electronic means.	(Straight On Internet Consulting, n.d.)

sented by Figure 1 depending on whether their interpretation of the terms is in a broad or narrow sense.

In Figure 1, on the *commerce* axis of the grid, the *narrow* end of the scale indicates sale or purchase, or commitment to purchase goods or services. The *broad* end of the scale includes transactions prior or subsequent to the purchase commitment such as comparison of goods and also payment. On the *electronic* axis of the grid, *narrow* depicts Internet transactions; the *broad* end includes all transactions facilitated by telecommunications technology.

APPLYING THE CLASSIFICATION GRID

Now that the definitions listed in Table 2 have been mapped onto the classification grid in Figure 1, it is possible to compile a list of example transactions for each quadrant of the grid.

Figure 1. Distribution of sample definitions on dimensions of electronic and commerce
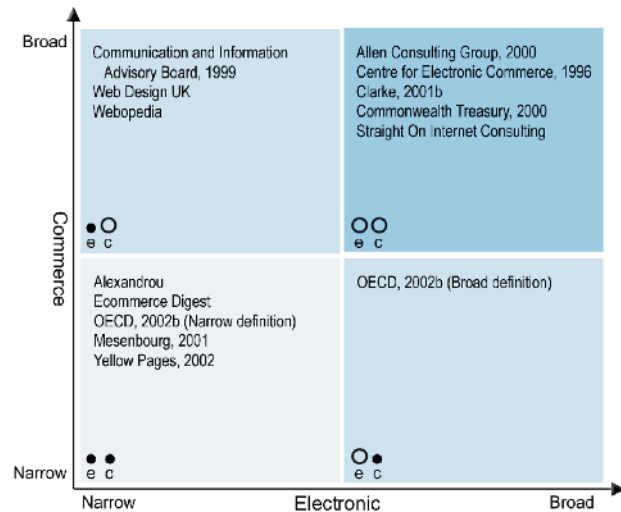
Narrow Electronic/Narrow Commerce

This quadrant represents ordering or purchasing goods or services over the Internet, for example:

- Purchasing a book from Amazon.com;
- Buying software from Macromedia.com; and
- Ordering craft items from a Web site and paying by mailed cheque.

Broad Electronic/Narrow Commerce

In this quadrant using any telephone technology (other than Internet) to order or purchase goods or services, for example:

- Using a telephone to order a pizza;
- Sending a SMS message from a mobile phone to order and pay for goods (Lindow, 2004); and
- An Australian Gas Company uses an IVR system to enable customers to order replacement gas cylinders by keying in their account number on their telephone.

Narrow Electronic/Broad Commerce

The focus now widens to transactions other than purchase but restricted to Internet technology, for example:

- After sales service and support, such as Norton's Auto Updates for Virus Definitions;

- Checking the football scores online; and
- Realestate.com.au provides online property listings.

Broad Electronic/Broad Commerce

This includes all transactions which are facilitated by electronic technology (other than the Internet) but excluding sales, for example:

- Paying for groceries in a supermarket with credit card; and
- Using phone banking to pay credit card, or transfer funds.

These examples are not meant to provide a comprehensive account of all e-commerce transactions but to show the variety and range of transactions which may or may not be classified as e-commerce depending on the definition adopted. Figure 2 shows examples mapped to the classification grid.

SME DEFINITION

Another term relevant to e-commerce research in regional communities is SME (small and medium-sized enterprise). As noted by Xydias-Lobo and Jones (2003) literature related to SMEs "sometimes suffers from methodological limitations such as unclear or inconsistent definitions of what constitutes an SME." The Small Business Coalition (SBC) has called for a clear and uniform definition of small business to enable greater clarification of eligibility criteria for government programs and for the collection of more reliable statistics (Thinktank, 2001).

Currently, there are a variety of definitions used by researchers and government agencies based on the number of employees, turnover, sector, or ownership structure (Holmes & Gibson, 2001; Rigby & Trantom, 2004). The OECD and U.S. Government define an SME as an organisation employing less than 500 staff (NZ Ministry of Economic Development, 2001), such a broad definition would include most enterprises in Australia! In Hong Kong, a manufacturing SME has fewer than 100 employees whereas a non-manufacturing enterprise is regarded as an SME if it has less than 50 employees, and in Mexico, industrial enterprises are classed as medium with up to 500 employees, but only need 100 employees to be classified as medium in the commercial and services sectors (Rigby & Trantom, 2004).

During 1999, the ABS conducted a review of the way businesses should be defined by size. In summary, the

Figure 2. Distribution of sample transactions on dimensions of electronic and commerce
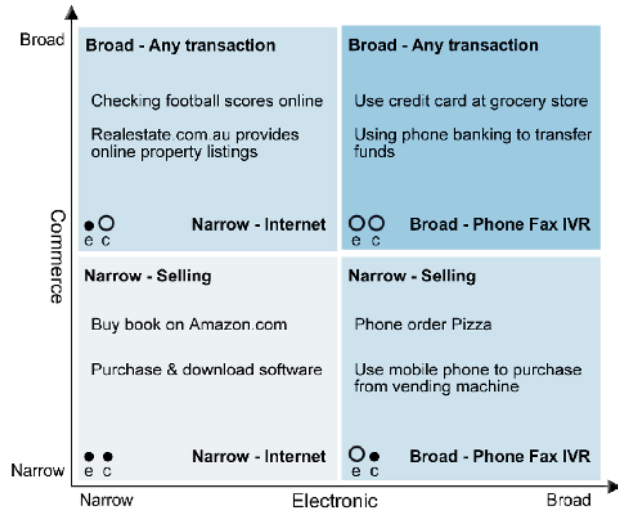
review recommended that for statistical purposes, small businesses (excluding agricultural businesses) should be defined on the basis of full-time equivalent (FTE) employment (ABS, 1995). Furthermore, small organisations are defined by the ABS (2002) as businesses employing less than 20 people. The ABS recognises three categories within that definition: non-employing businesses (i.e., sole-proprietorships and partnerships without employees); businesses with one to four employees; and businesses with between five and 19 employees. The first two categories are sometimes referred to as *micro-businesses*. Organisations with 20-199 employees are classed as *medium-sized* businesses.

CONCLUSION

This article has highlighted the inconsistencies in the current definitions and the wide range of transactions which can be classified as e-commerce. The U.S. Census Bureau recognises the importance of clarifying terminology. The Bureau has stated "it has been essential to use precise terms to discuss e-business transactions, processes, and the underlying infrastructure" (Mesenbourg, 2001). It is impossible to compare the adoption of e-commerce across countries and over time when different definitions are used, and often the definitions are not provided so the reader does not realise that invalid comparisons are being made.

This article cannot solve the problems of inconsistent definitions, however, from the analysis, the following recommendations are made:

- Authors of research and media articles, policy documents and reference texts should always define the terms and provide the reference or authority for the definition;
- Researchers designing survey instruments should endeavour to include greater granularity and avoid questions with simplistic *yes/no* responses;
- When reporting adoption statistics, authors should ensure that the relevant definitions are provided; and
- When conducting surveys and interviews, researchers need to ascertain how the respondent interprets terms such as *e-commerce*.

To facilitate effective communication between researchers, practitioners, educators and policymakers, it is of the utmost importance to establish and promote common understanding of the terminology.

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KEY TERMS

B2B Commerce: All types of computer-enabled inter-firm trade (Laudon & Traver, 2004).

B2C E-Commerce: Online businesses selling to individual consumers (Laudon & Traver, 2004).

Bluetooth: New technology standard for short-range wireless communication under 100 metres (Laudon & Traver, 2004).

E-Business: The digital enablement of transactions and processes within a firm, involving information systems under the control of the firm (Laudon & Traver, 2004).

E-Commerce Electronic Transaction: The sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks (OECD, n.d.).

E-Commerce Internet Transaction: The sale or purchases of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over the internet (OECD, n.d.).

EDI: Electronic data interchange–the direct computer-to-computer exchange between two organisations of standard business transaction documents (Laudon & Laudon, 2004).

Internet: An interconnected network of thousands of networks and millions of computers linking businesses, educational institutions, government agencies, and individuals together (Laudon & Traver, 2004).

IVR: Interactive voice response-a generic term for transaction systems allowing phone callers to use an ordinary tone-dialing telephone to interact with a computer through speech or dialed instructions. Each response by the caller triggers another recorded message until the transaction is completed (Elan Telecommunications Group Ltd., n.d.).

M-Commerce: Use of wireless digital devices to enable transactions on the Web (Laudon & Traver, 2004).

SME: Small and medium-sized enterprises. Defined by the Australian Bureau of Statistics as as businesses employing less than 200 full-time equivalent staff (ABS, 2002).

Determining Whether ICT Improves Social Interactions

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INTRODUCTION

Previous innovations, such as telephones allowed individuals to communicate on a one-to-one basis, or for powerful, central institutions to speak one-way to the masses (Burrows, 2000). New technologies such as the Internet are revolutionizing communications as a positive force, improving the efficiency and accountability of local government, and strengthening communities. This requires a vision in order to be able to actively *use* technology rather than passively reacting to change. Any advancement which is able to significantly empower people, also threatens to entrench the division between haves and have-nots—both as organizations and as individuals (Burrows, 2000). In the current climate, local government agencies are beginning to use these new technologies to open up the process of communication between governments and the citizens.

Essential to the technological challenges is the balance between three major elements—social capital, Quality of Life (QoL) and the technology itself. For instance, social capital is realized when the public perception that technological changes implemented in societies would enable advancements in daily routines of the public. These advancements, then, would contribute to better QoL. The link between the daily routines and the advancements is provided by technology. For example, using the Internet technology, public can order their groceries and this is seen as advancement as there may be considerable time savings, resulting in quality time spent with family. Therefore, local government agencies introduce technologies in their communities with the anticipation that the social fabric can be strengthened via these technologies.

Over the last five years social capital has become a main topic on the public agenda. Social capital is realized *between people who establish networks, norms, social trust and facilitate co-ordination and co-operation for mutual benefit and there is* increasing evidence to suggest that social capital is an essential ingredient in civil society, economic development, the health of people in communities and community development (Stone, 2001; UNCTD, 2002). Thus in communities where social capital is strongly rooted, people will feel that they are part of the community, useful and be able to make a real contribution to the community, will participate in local community networks and organizations, work together for the common good in times of distress, and valued for who they are (Chamber, 2002). This is shown in Figure 1, where the "ME" component is centered upon the family, work, friends and relatives, and the immediate neighborhood.

Quality of Life (QoL) is defined in various forms in the literature. For example, QoL is defined as subjective well-being by the Global Development Research Centre. QoL reflects the difference, the gap between the hopes and expectations of a person and their present experience. Earle and Fopp (1999) asserted that technology is a major social and occupational determinant in QoL and indicated that technology has reduced the need for direct interaction. As a consequence, communities are culturally experiencing a change. Others found that technology itself (e.g., Internet access) ultimately plays little role in determining individuals' quality of life as maturity and life experience replace the need for any dependence on an artificial support system (e.g., Granzin & Haggard, 2000). Therefore, while technology plays a crucial role in the social determination, how it is implemented is essential in order to ascertain the reach of this technology on the public. If the technology is properly implemented, then it may be possible to realize a better social capital.

Figure 1. Social capital (Adopted from Bullen & Onyx, 1999)
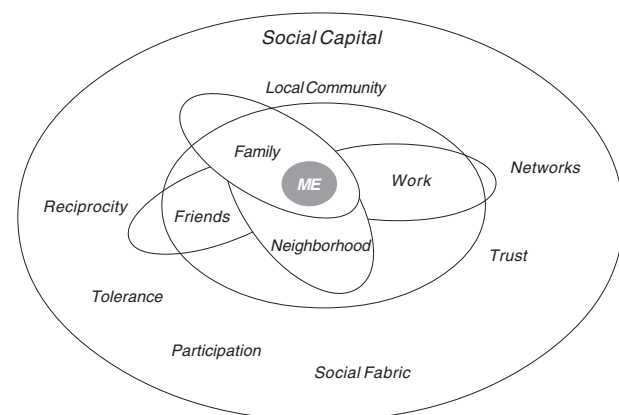
NETWORK NEIGHBORHOOD

Network Neighborhood (NN) is about using online technologies in order for people to communicate with each other when they want to, and develop strong communities of interest to keep them involved and interested in their neighborhood, so they have a sense of belonging (Gill, 2003). NN is a program designed to enhance the economic, cultural, social and environmental development and deliver better quality of life. Its main aim is to deliver a social dividend while increasing the reach and relevance of government and significantly cut the cost of government service delivery (Gill, 2003). Picton Waters Network Neighborhood project is one such NN project developed by an Internet-based software application in Western Australia to see if the Internet can help make stronger communities and better neighborhoods.

A growing body of literature has confirmed that social capital is correlated with positive individual and collective outcomes in areas such as better health, lower crime, better educational outcomes, economic development and good government (Carroll, 2002, p. 647). According to Bullen and Onyx (1999), it is possible to measure social capital in network neighborhood as there is a general social capital factor available in many forms such as participation in local community. In a neighborhood context, indicators help to evaluate whether local actions are having the effects desired.

Therefore, the main aim of this study is to test the claim that the NN would improve the QoL of the neighborhood community.

METHODOLOGY

This study used a mixed methodology. Initially, an interview method was employed in this study to identify indicators for measurement. This was then followed by a survey method. A QoL survey relies on the respondent's subjective rating of perception about QoL. Typically the spheres measured are primarily based around finances, health, family, friends and work (Ventegodt, 1996). Zehner (1996) measured QoL in terms of economic security, physical environment, family life, contentment, well-being, personal relationships and values, job-satisfaction, social relationships (non-family), leisure activities, health, religious values, parenting and housing and found housing, community, physical environment, social environment, and work, transportation and living costs to be significant factors. Shookner (2000) suggested that indicators such as social, health, economic and environmental should also be included in the QoL Index. This study used those social indicators identified by Zehner (1996) with consideration to the concerns raised by Earle and

Fopp (1999) who found that technology has reduced the need for direct interaction, and, as a consequence, communities are experiencing a change in the way their members interact with each other using online technologies.

The vital component of this project is to evaluate the effectiveness of NN in terms of whether the use of the online technologies improves the QoL of the community. It is hard to determine the most optimal or most suitable indicators to measure QoL in the context of ICT as the proposition that "the use of ICT in a community would improve (or worsen) the QoL" is quite new. It appears that there is limited research conducted to measure that impact of ICT on QoL (Keyes & Bancroft, 2002, p. iii).

Selection of Indicators

The QoL indicators have been selected following interviews with key personnel in the Department of Premier and the Cabinet in Western Australia. The interviews yielded specific characteristics appropriate to the indicators. They are timeliness of the indicators, reliability and stability, understandability, relevancy, usefulness, simplicity and honesty. Based on this, an initial theme for the indicators was developed from Kingsley (1999) and elaborated during informal, open interviews. The theme includes depression, stress, social isolation, safety, trust, opportunities, and equality. The themes were further studied resulting in a set of hypotheses.

Discussion of Hypotheses

Social support helps give people the emotional and practical resources they need. Belonging to a social network of communication and mutual obligation makes people feel cared for, loved, esteemed and valued. According to the World Health Organization Regional Office for Europe, this has a powerful protective effect on health. Through the use of NN, the members of the community can interact with each other through mail or being part of the various communities that are available through the network site. The NN helps in bringing the physical proximity of family and friends together, and one needs to measure the degree to which a person is socially integrated, or if there is any availability of social support networks being developed through the use of NN for the overall social well-being of the community member. Social well-being here is defined as including interactions among the members of the Picton Waters neighborhood community.

The hypotheses developed for this study covers areas such as depression, social isolation, safety, trust, opportunities and equality. These factors appear to have an impact on social isolation, and it is believed that by using ICT, it may be possible to alleviate the adverse

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impact of these factors. For instance, depression is a major medical disorder, just like high blood pressure or heart disease, and influences people day after day, affecting thoughts, feelings, physical health and behavior (Cleveland Clinic, 2001). These concepts are tested in the following hypotheses: s tested in the following hypotheses:

Hypothesis 1a: The use of the NN technology helps in the decrease of depression through the increased use of making friends and allies through chatting and e-mail.

Hypothesis 1b: The use of the NN technology helps in the decrease of stress levels through the increased use of making friends and allies through chatting and e-mail.

Hypothesis 1c: The use of the NN technology helps in the decrease of social isolation of a community member through the increased use of making friends and allies through chatting and e-mail.

Hypothesis 2: The use of the technology of NN helps in the feeling of mental and physical security when in crisis and hence creates a sense of safety.

Hypothesis 3: The prolonged use the NN helps in developing and building trust between members of the neighborhood community.

Hypothesis 4: The use of NN helps local small businesses with increased opportunities to exchange skills, goods and services.

Hypothesis 5: The use of NN site promotes a sense of equality among members.

Data Collection

The data collection involved the use of the survey as a vehicle for measuring social capital in family and community life. Questions in the survey are measured on the basis of the Likert scale, with respondents ranking their responses to a set of items on a range of numbers, from 1-5. The Likert scale has been used basically to ascertain the correlation between the positive and negative halves of the answer to the question. The Likert has been selected because it is easy to construct, tends to high reliability, is flexible and is the best in scaling people on attitudes, perceptions, personality characteristic and for the assessment of multidimensional constructs.

The questions compiled for this study were checked by the staff of the Department of Premier and Cabinet at Western Australia to ascertain the suitability and appropriateness. The questionnaire was then pilot tested by students and staff of a university in Western Australia. The pilot testing revealed that some questions were ambiguous and these questions were considered for refinement. Further, some other questions were re-worded for appropriateness. The Western Australian Government administered the questionnaire to the residents of Picton Water Community. The questionnaire was sent to a total of 39 households and the total valid responses received were from the 39 households. The responses were entered into a spreadsheet by two data entry operators and tested for any typographical errors. Any mismatch identified was corrected by using a file comparator method. Once the data entry was complete, the data was transformed into an SPSS software file.

Data Analysis

Participant demographics indicated that the majority of the respondents have been living in the neighborhood for a period of 3-10 years (33.3%). The majority of the respondents were in the age group 30-36 years (15.4%). The majority of the respondents had a tertiary qualification (51.3%) and was currently employed (74.4%). The entire respondents used the Internet (100%). And the average number of people in the household was four people. The data on location of Internet usage and intention for use had missing values and could not be thus quantified.

The data was initially analyzed for standard statistics such as mean and standard deviation. A normal curve was plotted on the descriptive to identify any "outliers" as responses sometimes may end up in extreme boundary values of the scale used. Any such outliers were eliminated from the data as these may cause bias. In this study, of the 39 questionnaires distributed, all responses have been considered valid and were considered for analysis. The data was then checked for "normality" and ensured that this feature was obtained. Further reliability tests were performed on the data and the reliability factor was ensured (over 0.73). Once this basic quality checking was accomplished, the data were tested for correlation.

The data were tested using the Pearson's correlation method. It was found that the correlation varied between 0.327 and 0.667 in many cases, with significance level under 0.05. This indicated that the questionnaire was an appropriate instrument, and the questions were measuring what was intended to be measured. Most of the questions were correlating positively with other questions either at 99% or 95% level of confidence. Exceptions to this were questions 16 and 12 and questions 14 and 3. Questions 12 and 16 measured community participation and making new friends and found to be negatively correlated. Questions 3 and 14 measured attendance in community events and the resulting social interaction and found to be negatively correlated.

DISCUSSION

The survey clearly indicated that people in the Picton Water community lead their lives mainly within their own household. They do not know the name of their immediate neighbours and rarely socialize with friends who live within a close distance of their home. They rarely talked to the people in the neighborhood. However, a surprising factor that emerged was that if there is a community or service group activity in the neighborhood, the majority of the respondents participated in the event. The respondents also indicated that they attended events in the nearby areas. The results of these interactions indicate that they are capable of making friends. While this study was not able to conclude whether the network technology facilitates the same level of interactions, it is believed that community members can increase their interactions using this technology. The "decrease in stress" level factor resulting from these interactions is not conclusive.

In terms of the second hypothesis, where "safety" factor was measured, the respondents indicated that a majority of them felt that if they socialize more and involved in more community work together they may get to know each other. Further, a majority of them are confident of making new friends/acquaintances if through various social events. The results also demonstrated that the majority of respondents do not meet outside these local events. The survey also indicated that the majority of the respondents felt a general feeling of safety in the neighborhood. The survey indicated that the "safety" factor was better at night time as well. This feeling of safety has been strong because a majority of respondents felt people in the community have a respect for their community and each other. Further, they participated in local events even if they are not personally asked or invited to do so and are not afraid to participate even if they do not know anyone or won't be accepted. Therefore, it is concluded that using the network technology, it is possible to build "safety" in communities.

Hypothesis 3 dealt with "prolonged" use of technology and its effect on trust. As it was not possible to collect longitudinal data in time for this publication, it is not possible to provide comments on this hypothesis.

There is clear evidence to indicate that socialization and interactions in community events is limited only to these events. The results also show that the majority of respondents do not have sense of belonging to their neighborhood and this can be attributed to the fact of they do not know their neighbors personally and do not socialize with people close to their home. Further, due to lack of data on their use of technology for online transactions, it is not possible to ascertain whether there are opportunities for exchange of goods and services using this tech-nology. While the indications are that there are possibilities, due to lack of strong numerical evidence, hypothesis 4 is rejected.

The fifth hypothesis, equality among members, is accepted as the data clearly indicates that members in the community felt that they have equal opportunities in event participation. Further, when this aspect is combined with the safety data, it is evident that the perception of equality is valid. Therefore, this hypothesis is accepted.

CONCLUSION

This research has made a number of findings about the social behavior of people of Picton Waters and has documented a number of issues in the use of NNs. In terms of project completion at the preliminary stage, the objective of accessing the social behavior (through the measurement of the social indicators identified) of the people in Picton Waters through the introduction survey was successfully completed.

The second objective, a longitudinal survey based on continual use of technology was not completed on time due to some unanticipated problems in administrating the survey to the same set of respondents. Therefore, the results of the same were not available in time to prepare this report. Hence, the hypothesis with the use of NN technology could not be measured as planned initially.

In conclusion, it can be said that there are indications that the NN technology could help in improving the QoL of the people in the Picton Waters community as it could be an excellent way of improving the social interactions between the community members.

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KEY TERMS

Identity: Identity results from interplay of three related factors: "whether one considers oneself part of the group, whether other group members treat one as a member, and whether people outside the group do" (Resnick, 2002, p. 654).

Quality of Life (QoL): QoL may be defined as subjective well-being. Recognising the subjectivity of QOL is a key to understanding this construct. QoL reflects the difference, the gap, between the hopes and expectations of a person and their present experience. Human adaptation is such that life expectations are usually adjusted so as to lie within the realm of what the individual perceives to be possible. This enables people who have difficult life circumstances to maintain a reasonable QoL (The Global Development Research Centre, 2003).

Social Interaction: Social Interaction/Belonging includes links with social environments and includes the sense of acceptance by intimate others, family, friends, co-workers, and neighborhood and community (University of Toronto, 2003).

Sustainable Communities: A sustainable community (like NN) offers its members a greater sense of security which leads to less reliance on the health and welfare systems as replacements for social activity, and crime decreases as individuals feel a greater sense of inclusion and are not disenfranchised (Gill, 2003, p. 7). In addition to that, a greater sense of security would also mean "greater sense of personal safety in the community" (Canadian Policy Research Network, 2001). Therefore, greater sense of security would lead to higher QoL, with less worry and more freedom (greater feeling of being safe).

Developing Regional Communities in Turkey

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INTRODUCTION

Virtual Communities (VC), as defined by Rheingold (2000), are the social groups formed in the cyberspace when enough people carry on public discussions long enough and with sufficient human feeling. VC enabled by the ICT technologies are formed in two ways. Either their members can be actively engaged with each other and tightly coupled in e-mail discussion and communication groups, or they can be the passive observers of the Web pages and thereby loosely coupled with other members of the community. The Computer-Mediated Communication (CMC) among the members of the VC is facilitated by Community Informatics (CI), which is defined by Gurstein (2000) as a

technology strategy or discipline which links economic and social development efforts at the community level with emerging opportunities in such areas as electronic commerce, community and civic networks. (p. 1)

This article will provide an overview of regional VC in Turkey. It will focus on the rural, rather than the urban regions of the country. By "rural areas" is defined here as the entire country excluding major metropolitan areas such as Istanbul, Ankara, Izmir, Adana, and Bursa. It is hypothesized that in such areas economic and social hardships as well as cultural characteristics constitute major obstacles in the development of VC. The losing side of the digital divide within the country will be investigated and possible future trends will be examined. Although the penetration of ICT and the sophistication level of CI in some urban areas of the country are comparable to developed countries, this article will exclude such spheres.

BACKGROUND

Turkey is located between South-Eastern Europe and the Middle East and has close historical ties with the Western and Eastern world. Partly due to Turkey's bridging characteristic between the East and the West, the country has strong traits from both worlds. As one foreign observer (Wolcott, 1999) notes, Turkey is

Table 1. Some economic and social indicators of Turkey as compared to the average of medium development countries

	GDP per capita (2001)	Adult literacy rate (2001)	Physicians per 100,000 people	Infant mortality rate per 1000 births (2001)
Turkey	USD 2230	85.5%	127	36
Average of the 86 countries	USD 1929	83.3%	131	40

a land of dramatic contrasts. [..] The Western portion of the country, centred on Istanbul, offers a cosmopolitan, urban life for over half of Turkey's population. Most of the country's geography, however, consists of pastoral agricultural regions. (p. 5)

and "both the conservative and liberal ends of the social spectrum are well represented" (p. 57) in the country. Such contrasts provide an additional fertility for a stark digital divide within the country.

By most economical and social indicators, Turkey is a developing country. United Nations Developing Program (UNDP) issues yearly Human Development Reports (UNDP, 2003) where countries are compared according to several development and life quality criteria such as Gross Domestic Product (GDP), education, and access to health services. The 2003 report ranks and categorizes the countries in three groups, namely high (55 countries), medium (86 countries), and low (34 countries) human development. In the 2003 report, Turkey is ranked in overall human development somewhere in the middle of the Medium Human Development group. Table 1 shows some economic and social indicators of the country as compared to the average of the 86 medium development countries (*ibid.*)

Technology diffusion and usage indicators of Turkey and the average of the medium development group in the same report are shown in Table 2 (*ibid.*)

As Table 2 shows communication instruments are exceptionally used in the country. Disregarding the incomparable tiny island countries, Turkey is ranked second in the penetration of both mainline telephone and GSM subscriptions in the group of the 86 medium development countries.

Table 2. Some ICT indicators of Turkey as compared to the average of medium development countries

	Telephone mainlines per 1000 people (2001)	GSM subscribers per 1000 people (2001)	Internet users per 1000 people (2001)	Personal computers per 1000 people (2001)	Scientists and engineers in R&D (per million people 1996-2000)	Receipts of royalties and licence fees (USD per person - 2001)
Turkey	285	295	60.4	41	306	0.0
Average of the 86 countries	110	88	31	-	597 a	1.8 b

Wolcott (1999) investigated the diffusion of the Internet in the country where he identified an analysis framework with six dimensions, each having levels from zero (least advanced) to four (most advanced). According to this framework, the diffusion dimensions and their levels for Turkey are shown in Table 3.

Although these figures and ICT usage are above the average of the comparable developing countries, the number of scientists and engineers and the receipt of royalties and licence fees are much below the average as Table 2 shows. This indicates that the people in the country are fascinated with the usage of technology but there is insufficient scientific activity to support it.

CULTURE AND BEYOND: RURAL VIRTUAL COMMUNITIES IN TURKEY

Most developing countries tend to have oral rather than written culture. This also applies to Turkey where communication instruments such as daily circulations of newspapers, mainline and cellular telephones, radio and television penetrations can be used to gauge the tendency of the population in the dichotomy of oral-written culture. Although telephone, radio, and television penetrations are much above the average of the comparable countries, daily newspaper circulation is about three million in the country, which is below the average of comparable countries. This shows a clear orientation to the oral culture and such an orientation is not a supportive medium for the computer-mediated communication which predominantly requires written communication skills.

A striking feature of CI initiatives in the rural areas is the lack of personal Web pages in the appropriate Web sites. This is possibly related with the prevalent collectivist culture (Hofstede, 2001; Kabasakal & Bodur, 1998) in the country where individuals are deemphasised and the community has a prominence in the social life. On the contrary, one could see some level of personal Web pages in the sites originating from urban areas, indication of some higher level of modernisation and the corresponding level of individualism.

Hall (1976) distinguishes high-context and low-context cultures according to the means people communicate. High-context communications involve "pre-programmed information that is, in the receiver and in the setting, with only minimal information in the transmitted message" (*ibid.* p. 101). In low-context communications, the message must also contain some explicit information about the context. Low-context cultures are highly individualised and people are somewhat alienated from each other. Hall further argues that man's mechanical extensions can be relatively easily absorbed and used and, as a result, "people become more and more like their machines" (p. 39) in these cultures. On the contrary, information is widely shared and "messages with deep meaning flow freely" (p. 39) in high-context cultures. Hall gives the example of Germans and Swiss for low-context, Arabs and Chinese for high-context cultures. Turkish culture also has clear traits for high-context communication.

The implications are clear: Easy absorption and use of mechanical extensions such as computers provide certain advantages for the ICT production and use in low-context cultures. Additionally, most ICT are only capable of

Table 3. Wolcott's analysis framework for Internet diffusion in Turkey

Pervasiveness	Geographic dispersion	Sectoral absorption	Connectivity infrastructure	Organisational infrastructure	Sophistication of use
3 → common	4 → nationwide	2 → moderate	2.5 → expanded, nearly broad	3 → competitive	2 → conventional

transmitting the message, not the context related to it. This is more so for the new types of ICT such as computers rather than older types such as telephone and television. Putting it in another way, computers can never replace face-to-face communication and its ability to transmit the context. E-mail, the most commonly used CMC instrument, is a good example for this. Its support for transmitting the context cannot go beyond a few predetermined signs such as ":)". Such a limitation can be an important barrier for the people of high-context cultures in using computers and forming virtual communities.

Understandably, such cultural traits are more prevalent in rural areas than cities of developing countries which usually have a higher degree of modernisation. But this does not mean that it is impossible for rural local communities to use ICT effectively. They only have a retarding effect on the development of VC and CI initiatives and that effect requires more effort and more time to overcome the barriers.

Due to these cultural and economical barriers VC in the rural areas of Turkey are quite rare. Yet, the level of computerisation in the country seems to have a potential to act as a catalyser for the formation and further development of such communities. The initiatives that foster this process are either carried out by the government or by the citizens. There are various types of such government initiatives:

a. The central government in the country provides some sort of CI initiatives for citizens such as access to the new legislation passed from the parliament or their social security records. Such an initiative covers the entire country and citizens in a specific region are only the passive recipients of that service. In other words, it is not specific to the region and therefore it is arguable that it can be classified as an example CI. Nevertheless, it can contain useful information such as links to the website of the local branch of the agency or the local telephone directory (e.g., http://ttrehber.gov.tr/rehber_webtech/index.asp).

b. Local branch offices of some of the central government agencies may provide CI service to the local community. Almost always such a service is provided through Web publishing and usually no discussion groups are involved. Even if forum pages are provided in some of the sites, they have extremely low number of messages. Some examples to this category are the Web sites of the local hospitals of Social Insurance Institution (SSK) serving the local community in remote areas (e.g., http://www.ssktavsanli.gov.tr) and the local branches of the Ministry of Education (e.g., http://hakkari.meb.gov.tr).

c. An overwhelming majority of the elected local governments (municipalities) have Web sites. Turkey has 81 administrative provinces and about 900 sub-provinces. Almost all of the municipalities have some sort of existence in the cyberspace. Yet, although some of their Web sites offer discussion forums to the members, such forums are almost always inactive.

The central government does not have any programs to support rural CI initiatives and, as at the beginning of 2004, there were no examples of CI initiatives in the country built on the funds of foreign donor organisations. Consequently, all such initiatives were accomplished with very limited financial resources, often based on volunteer effort. Some models of such non-government CI initiatives are as follows:

a. The first model, which is based on the efforts of the local enthusiasts, usually aims to provide some information about the local geography, history, and community to the outer world. Drawing on the space-independent quality of the Internet, the initiator(s) may or may not reside in the region. Some of them live in other regions of the country or overseas, taking the benefit of better exposure to the new technologies. A good example to this group is http://www.akhisar.com which is about the town of Akhisar, located in the Western part of the country. Its initiator is an expatriate living in the US and it is totally based on volunteer labour where some volunteers are foreigners. Although it is mainly in Turkish language it contains some information in eight other languages.

b. The second model is the one which is supported by some local commercial organisations. Such initiatives usually aim for profit and revenues are obtained by offering advertisement service to local companies and sometimes to political parties. They contain useful information for the community such as films currently showing on local movies, local radio and TV programs, and local news (usually with the support of a local newspaper), free personal advertisements for buying and selling, and announcements of events such as concerts and exhibitions. An example to this group is http://www.eskisehir.net which is provided by a local ISP (Internet Service Provider) company in the town of Eskisehir.

Besides government and non-government CI initiatives, there are also branches of some semi-official professional organisations in rural areas which have some existence in the Web. It could be argued that they could indeed be regarded as CI initiatives, because their websites

provide some services to the local community as well as to the local members of the profession. Due to the abundant number of such organisations and their branch offices in all over the country, there are thousands of such Websites. Local branches of the Bar Association (e.g., http://www.aydinbarosu.org.tr), Chamber of Electrical (e.g., http://diyarbakir.emo.org.tr) and Civil (eg. http://www.imosamsun.org.tr) Engineers, and Chamber of Trade (e.g., http://www.berto.org.tr) could be mentioned as examples to this group.

Some of the regional Websites and their associated discussion lists (if any) can be accessed from Google (2004) regional directory.

FUTURE TRENDS

The CI initiative in the Western town of Yalova is an example of what the future of CI and VC could be like in Turkey. Before losing his post in the 28 March 2004 elections, Mayor of Yalova had a strong commitment to ICT-led development of his town and had started the initiative of "Yalov@: The Town of Informatics". To this end, partly inspired by examples such as Bangalore in India, he sought to attract domestic and foreign ICT companies to the town, acquired the membership of Telecities group which is a European network of cities committed to leadership in the Information and Knowledge Society (see www.telecities.org), and organised the "Symposium of Informatics Action Plan" to develop a model for pioneering ICT-led local development in the country. The Municipality also established Neighbourhood Communication Centres with the aim of being in computer-mediated communication with the citizens, and set up 12 Internet kiosks in the town for public use (Anonymous, 2004; Kocal, 2002).

It is yet to be seen whether the new Mayor will have the same degree of commitment to the project as his predecessor. Thus, in the absence of a coherent and country-wide plan for such local ICT initiatives, the sustainability of such sporadic projects is largely dependent on the personal preferences of community leaders. This is an important dimension of the sustainability problem which is widely discussed among the CI researchers (Ramirez et al., 2002; Taylor, 2004).

Possibly related with the cultural traits, the emphasising tone of the Yalova experiment is toward better governance and ICT-led economic growth of the region rather than fostering community empowerment and developing VC. However, it could be argued that the number of such experiments, although sporadic, will increase in future with intensified emphasis on VC.

The importance of the Yalova experiment comes from the fact that, unlike most other initiatives, it is an inte-

grated and well-planned project. Additionally, it was initiated totally by local resources. Due to the economic difficulties and huge debt burden, it is unlikely that the state will be able to support such initiatives in near future. The project was dependent on one local leader, and it is not easy to find such leaders in the rural areas of the country. Conditions in the country are also currently far from supporting such initiatives systematically. Hence, Roger's (1995) concept of critical mass in diffusion of innovations has to wait for some time for the diffusion of VC in rural areas of Turkey.

CONCLUSION

Being on the losing side of the digital divide in the country, the main characteristics of the CI initiatives in rural areas of Turkey are their sporadic, weak, and usually unsustainable nature. So much so that it is open to debate whether many of them could be regarded as perfect examples of CI and VC. Although there are many regional websites, the presence of rural e-mail discussion groups is quite rare. Unlike developed countries where many CI initiatives are financially supported by the state (Bruce, 2000; Thompson, 2004), rural CI projects in Turkey are either started by a few local computer enthusiasts in an amateur sense, or local businesses with the objective elevating their profiles. Some of the amateur CI initiators are the public officers who wish to have their organisations take part in the cyberspace. There are very few rural VC based on local e-mail discussion groups, and an overwhelming majority of the websites are static which do not allow user interactions such as commercial transactions.

Besides economic hardships which limit people to have access to the ICT, the most important barrier to the development of such VC is a set of cultural factors such as strong tendency to the oral communication which is not favourable for CMC. Additionally, the predominantly high context communication in rural areas cannot be served by CMC which strips context such as emotional and facial gestures. From such points, unlike the urbanised compatriots who are usually more educated, have more contacts with the outer world, and more inclined to the written culture, people in rural areas in the country are mostly untouched by modernisation and the speed of change is less than ideal. As a result, wherever some CI initiatives emerge in rural areas, they tend to be in the form of static Web pages serving some trivial needs of the local community rather than vivid e-mail discussion lists where public issues are discussed "long enough and with sufficient human feeling" (Rheingold, 2000, p. xx). This leads to rural people being loosely coupled with the new technology, perhaps only getting insignificant benefits from it. Hence, it could be argued that, unlike many of the

examples in urban areas, rural VC and CI initiatives in Turkey are in their infancy and have a long way to go in order to fulfil these terms.

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KEY TERMS

ADSL (Asymmetric Digital Subscriber Line): A method implementing numerical coding technique for fast Internet access. It uses the ordinary telephone line and splits the signals of voice and data. It can offer speeds up to 8Mbps.

FTP (File Transfer Protocol): A computer protocol used for accessing a remote computer over Internet and retrieving files from it.

ISDN (Integrated Services Digital Network): A communication technology which allows the clear transmission of voice, data, image, and their combinations. ISDN users can have more than one call at a time.

Portal: A gateway serving as a starting point for accessing several services offered by a CI (or e-commerce or e-government) system.

Scale-Free Networks (in E-Mail Discussion Lists): The characteristic of the majority of the e-mail discussion lists where a small minority of the members post the majority of the messages.

TCP/IP (Transmission Control Protocol/Internet Protocol): A network protocol used by computers in communicating to each other even if they use different operating systems. It is the primary protocol used for accessing the Internet.

Web Server: A computer used for publishing the contents of a Web site. It is usually dedicated for this service and depending on the prospective visitors; it can be an ordinary PC or a very powerful computer.

ENDNOTES

[1]   For available data only.
[2]   For available data only.

Developing Regional Destination Marketing Systems

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INTRODUCTION

Many regional and rural centres in Australia view tourism as an increasingly important area of economic opportunity (Commonwealth of Australia, 2002). With the Internet as an increasingly important source of information for travelers (Zhou, 2004), destination marketing systems have an important role in distributing this information. Destination marketing systems store and distribute information about a diverse and comprehensive range of tourism suppliers, visitor attractions, and events in a particular destination region (Crichton & Edgar, 1995; Frew & O'Connor, 1998). Tourists require a wide variety of information on geographical regions, facilities, attractions, and activities at destinations (Buhalis & Spada, 2000), which destination marketing systems collate and deliver.

A destination marketing system is primarily a marketing tool for promoting tourism in a particular destination, which can be a nation, region, town, or other recognisable geographical entity (Jung & Twigeri, 1999). Web site technology is pivotal in destination marketing systems, which take advantage of all the benefits of e-commerce and Web site marketing offers. As well as these, they have the benefits of cooperative marketing, such as the pooling of resources. Originally, they were developed to cater to smaller leisure-focused suppliers, who were not benefiting from the larger centralised reservation systems and global distribution systems (O'Connor, 1999). Thus, they have a lot of potential for the Australian tourism industry, which is characterised by a large number of small businesses, and many public-sector destination marketing organizations that carry out the destination marketing. However, while larger tourism businesses have been early adopters of technology, smaller businesses have utilized a limited range of online functions (Cooperative Research Centre for Sustainable Tourism, 1999).

Where a destination marketing system differs from other technologies is that it involves the cooperation of different organisations as stakeholders. This study used an action research methodology to examine the development of a destination marketing system for a budding tourism region, and examined the stakeholder issues that emerged as obstacles to taking advantage of this technology.

BACKGROUND

Despite the potential benefits of destination marketing systems, there has not been a lot of success (Buhalis & Spada, 2000). The majority of destination marketing systems have been implemented at the local level and operate on a limited basis, or collapsed a few years after their initial development (Archdale, Jones, & Stanton, 1992; Buhalis & Spada, 2000; Pringle, 1994). There has been a plethora of reports on destination marketing systems (Frew & O'Connor, 1998), with failure occurring at the planning stage as well as at the operational, with conflicts between the public and private sector, and conflicts between sales to consumers and the travel industry (Tunnard & Haines, 1999). With such problems experienced in destination marketing systems, two main streams of research have emerged: one that has sought to develop a framework for the analysis of destination marketing system reports, and another that has sought to develop appropriate approaches to successfully developing destination marketing systems.

The development of a framework for analysis has been driven by the need to have a common framework to analyze reports on destination marketing systems, such as the Norwegian Tourism Guide (Tjostheim & Aanonsen, 1997) or the Spanish National Tourism Organisation (Castelltort, Mora, Navarro, Pernas, & Zapata, 2000). Noteworthy research into a framework for analysis has been conducted by both Frew and O'Connor (1998, 1999) and Buhalis and Spada (2000).

Frew and O'Connor's research (1998, 1999) identified a number of important attributes of destination marketing systems from previous research and then surveyed experts to refine the framework to give the criteria a weighting. This framework was then applied to four cases of Austria (TIS), England, Scotland, and Ireland, and later to Australia (Daniele, Mistilis, & Ward, 2000). The analysis found that there was no consistency in attributes such as technical issues, requirements definition, or communications that caused failure—though a central challenge was addressing stakeholder issues.

Research by Buhalis and Spada (2000) developed "criteria for success" by looking at the requirements and goals of different key stakeholder groups. This was based

on the idea that partnerships and cooperation between stakeholders are needed to deliver full services to tourists, and to ensure a destination marketing system could succeed in delivering this. It was found that the dissimilar objectives and interests of stakeholders represent obstacles to destination marketing system development and implementation.

The research by Frew and O'Connor (1998, 1999) and Buhalis and Spada (2000) established the importance of stakeholder cooperation in destination marketing systems. A difficulty with the framework for analysis approach is that it is intended for use after the development of the system. However, there is yet to be research to investigate the form such relationships take, and in what manner relationships factors affect destination marketing systems.

The alternate stream of literature has sought to develop and trial different development approaches to developing destination marketing systems. This research endeavors to establish best practices to developing and implementing destination marketing systems. Some of the development approaches documented include virtual organizations (Martini, Jacucci, Cattani, & Claza, 2000), the information concept and destination management (Schucan, 1998), the integrated strategy approach (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997), Intelligent Destination Management System© (Pollock, 1998), and Tele-cooperation and Virtual Enterprises (Laubenheimer, Carlsson, & Makinen, 1999).

A central issue from this stream of research into development approaches was of the importance of stakeholder relationships behind the technology. The Internet was viewed as enabling new forms of cooperation with destination marketing systems (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997), while success was dependent on the relationships between stakeholders (Martini et al., 2000; Schucan, 1998). In contrast to the retrospective stance taken in developing the framework to analyze destination marketing systems, this research sought to find solutions to stakeholder cooperation problems that were actionable.

RESEARCH METHOD

This research sought to investigate the stakeholder cooperation issues with action research. In action research, the researcher is a participant in the implementation of a system but simultaneously wants to evaluate a certain intervention technique (Benbasat, Goldstein, & Mead, 1987). As the researcher participates in the process of change, they have two objectives: to take action to solve the problem and to contribute to a set of system development concepts (Checkland, 1981).

The strength of action research is the in-depth and first-hand understanding that the researcher obtains (Benbasat et al., 1987), while it allows both inductive and deductive research processes in a structured manner (Perry & Jensen, 2001). Thus, it allowed the research to be inductive, give the researcher first-hand experience in developing a destination marketing system, and allow for application of a development approach from the existing literature. The development approach from Tschanz and Klein (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997) was selected as the intervention technique, as it explicitly addressed stakeholder cooperation.

It should be noted that action research has been criticized as having little objectivity and limited generalisability of findings (Benbasat et al., 1987; McKay & Marshall, 2001). The method primarily relies on the researcher's analytical techniques to develop outcomes and findings into an abstract manner, though due to the nature of the research method, there are no statistical generalizations that can be made to wider populations (Perry & Jensen, 2001). However, information systems research has been considered an applied discipline, and methods such as action research have allowed an applied orientation directed at improving practice (Keen, 1987). In the area of tourism information systems, action research has been used in projects such as those by Alford (2002), Laubenheimer et al. (1999), and Martini et al. (2000).

While there is little difference in technology available for use in destination marketing systems across the world, the social and political relations differ in contexts with different political and social structures. Thus, this research sought to investigate these relationships and how they influenced destination marketing systems in the Australian tourism industry.

RESULTS

Using the development approach from Tschanz and Klein (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997), the integrated strategy approach, a destination marketing system was developed for the Greater Dryandra region, located southeast of Perth in Western Australia. In 1997, the Dryandra Woodlands Focus Group formed with an aim to create a sustainable tourism industry in the area of Greater Dryandra, and by 2001 had secured funding from seven local government councils and a federal government grant for the employment of a tourism development officer. The tourism development officer identified the need for the development of a regional Web site to increase awareness of the tourism assets in the area, which initiated the development of the destination marketing system.

The integrated strategy approach (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997) encompassed four main phases: destination and competition analysis, market analysis, strategy development, and strategic fit. Stakeholder cooperation was considered largely in the strategic fit phase, giving consideration to the innovation, cooperation, market orientation, and resource allocation characteristics of different stakeholders. Consideration was also given to the market-oriented, financial-oriented, and social concepts in relation to goals, potential performance, and functional strategy.

Initial analysis of the situation found there was no database of existing tourism information and product in the region. All current information resided in a portfolio of brochures that were of various standards. There were no cooperative brochures for the distinct region of Greater Dryandra, and only a few produced by the regional tourism authority for the broader region, while localised brochures were produced by some of the seven local government councils. A spreadsheet that recorded tourism supplier information was the only electronic copy of information. Before a Web site could be developed, this information needed to be collected and collated in a centralised database. The development of a database offered its own benefits for the region: the tracking of tourism product offerings in the region; a source of information for tourism bureaus when making recommendations to visitors; and the tracking of information accreditation and communications with tourism suppliers.

The database would be the source of all information on the Web site, storing all tourism data and information for the region, including digital photographs. There was little need for dynamically created Web pages, because information would not change frequently, so the styles, designs, and layout of the Web site were determined and programmed into the database application. Updating the Web site would be as easy as updating the database, and then clicking on the right button.

The Web site was to be the first cooperative marketing endeavour for the Greater Dryandra region, making information on tourism sites and products available to potential visitors. Following the integrated development approach (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997), the marketing plan for the region was considered to ensure the Web site strategy was inline with the region's overall strategy, and the regional brand would be integrated with the Web site to establish a consistent marketing image for the region. A Web site strategy was developed, establishing Web site goals, target market, cooperative opportunities, and competitive threats.

To deliver value to potential visitors and the tourism suppliers, the Web site needed to have more information than simply phone-book-type listings, which other Web sites offered. It was determined that the Web site would offer comprehensive detailed information such as town maps and photographs, while suppliers would be given the option of having their own Web page within the site that included promotional paragraphs and photographs.

Following recommendations to achieve stakeholder cooperation outlined in the integrated development approach (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997), consideration was given to how the innovation, cooperation, market orientation, and resource allocation characteristics of the tourism suppliers fit with those of the Web site. Informal visits were made to a number of tourism suppliers to become familiar with the supplier's orientations and technological competencies. For example, there was generally not a high level of technology competency in the region, so information was to be collected using manual forms, and digital photographs were to be taken for the suppliers. It was thought that this would ease the burden on the tourism suppliers and let even those without technology skills participate.

Financial and human resource allocation details were also determined, with policy and procedures put in place for the collection of fees for membership to the Web site, and the tourism development officer being given the role of Web site updates. This determined who the back-end user of the system would be, which allowed the Web site developer to tailor the back-end system to the technology skill level of the tourism development officer.

Once the system was ready to go online, it was a matter of collecting all the data and media needed. The data collection forms were developed and sent with explanatory letters to the tourism suppliers, while information on public tourism products was gathered by the Web site developer and tourism development officer. All operators were to have phone-book-type listings, while it would cost a tourism operator 50 Australian dollars per annum to have their own page within the Web site, containing photographs and promotional paragraphs. Operators were advised that this fee would go toward maintaining the destination Web site and contributing to its running costs, and possibly promotional activities. For this fee, the digital photographs would be taken for the operator, unless they wished to provide their own. Just as the operator information was collected using a paper-based form, information updates could be requested this way also.

To encourage participation, the Web site was publicised at regional seminars. However, to the disappointment of the Web site developer and tourism development officer, very few suppliers decided to join the Web site. From the 70 tourism suppliers in the region, only 13 decided to become paying members of the Web site—a participation rate of under 20%. This was a major

stumbling block, as the Web site's usefulness to potential tourists depended on having comprehensive information on tourism products in the region. While all suppliers in the region had free phone-book-type listings, few had detailed listings.

LESSONS LEARNED

While the destination marketing system had been a technical success in having the ability to collate and present information on tourism products in the region, the lack of participation by tourism operators reduced the usefulness of the destination Web site for potential tourists. Though the technology certainly enabled new forms of cooperation (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997), its development had not changed the existing status of cooperation in the region.

An important factor was the restricted time frame—all of this took place in a single year. Prior to the destination marketing system development, the Dryandra Woodlands Focus Group achieved cooperation through a number of local councils and other major stakeholders but had very few initiatives to develop cooperation between the tourism operators. A series of regional seminars had been initiated in an attempt to foster cooperative attitudes, but it had generally been difficult to engage tourism operators, who seemed to have a lack of time, or did not see any direct benefits from the seminar initiative. Although the Dryandra Woodlands Focus Group had been together since 1997, it was only in 2001 when activities such as the destination marketing system and seminars began and became more visible to the tourism operators. Both the seminar and destination marketing system initiatives suffered from a lack of awareness. There was perhaps a need to operate for longer periods before awareness was raised through the social networks in the region.

Tourism operators may have been waiting to see what outcomes were delivered before they invested their time and money with the Dryandra Woodland Focus Group. Agency theory has been used in other contexts (Logan, 2000; Mole, 2002) to explain how a principal uses information on the credibility of the agent before allowing them to carry out activities on their behalf. This could possibly have been the case with the Dryandra Woodlands Focus Group. Trust is another relationship element that is developed over time (Morgan & Hunt, 1994), which also is an enabler of cooperation.

With the destination marketing system, it seemed the special efforts made to accommodate for the lack of technology skills was not enough to encourage high levels of participation. The suppliers that participated appeared to have an understanding of the value of Web site marketing and were appreciative of the opportunity to participate in Web site marketing without needing the technology skills. The nonparticipants perhaps did not see these benefits, which meant that rather than a skill gap, there was a knowledge gap that inhibited participation in Web site marketing for these suppliers. Thus, while technology adoption research has considered technology skill a critical factor in adoption (Thong, 1999), it was the knowledge of benefits of the technology that was a factor in this case.

The value of participating may have been compared to other available forms of marketing, as in a marketing channel selection (Buhalis & Laws, 2001), though at only 50 Australian dollars, the destination marketing system was a very low-cost system compared to other forms, such as brochure production and other regions' cooperative marketing and Web site marketing. However, with a low technology skill base, this would possibly influence tourism operators' perception that their customer base would also not use online information sources, and therefore regarded Web site marketing as an unproductive marketing mechanism. The tourism operators would perhaps consider the destination marketing system as a "support" channel, if using the portfolio framework presented by Jung, Louvieris, and Oppewal (2002). Tourism operators in the region also had lifestyle motivations that may have inhibited their desire to greatly increase their business (Dewhurst & Horobin, 1998).

Before time could pass and greater awareness, trust, and credibility could be developed, further stakeholder obstacles were encountered. After the first year, the federal government grant for the tourism development officer position came to an end, and some of the local government councils in the Dryandra Woodlands Focus Group could not provide additional funding to make up for the shortfall. Therefore, the tourism development officer position was put on hold; and while the Web site was left online, it was left without someone to update information or promote it to consumers or the tourism operators. This left the Web site with only 13 suppliers with full listings.

About a year later, the Dryandra Woodlands Focus Group shifted their focus, deciding to concentrate their efforts and funds on developing new and existing tourism products, rather than on promotional activities. They would no longer support initiatives such as the regional branding or the Web site, and so the Web site was passed onto a newly formed regional information centre in one of the seven councils. These stakeholder issues were beyond the realm of the cooperation supported by the destination marketing system but had ultimately resulted in its long-term demise. Had the destination marketing system been an enormous success, perhaps it would have encouraged the councils by signaling the effectiveness of their cooperation, but it would have been only one of many contributing factors.

The integrated development approach (Klein & Tschanz, 1996; Tschanz & Klein, 1996, 1997) worked well in integrating the marketing plan of the destination region with the destination marketing system. At a functional level, it resulted in a strong consideration for the lack of technology skill in the region, though this had proved to be enough to develop the level of participation by tourism operators that was desired. Cooperation at the level of tourism operator participation in the destination marketing system was a major problem, an experience that has been had elsewhere in Australia (Daniele et al., 2000). The nature of the development approach perspective examined by action research methodology was productive in highlighting this issue, which could benefit from further research focused particularly on tourism operator participation.

CONCLUSION

While the destination marketing system was a technical success, the stakeholder issues were the downfall of the system. Funding issues were a major stumbling block but were not in the control or influence of the destination marketing system. A prominent problem was the lack of participation from tourism operators. Without the participation of tourism operators, the system and Web site could offer little value to potential visitors. This is a major cause for concern, especially because the benefits afforded to small tourism businesses are often the justification for development of destination marketing systems.

A number of factors influenced tourism operator participation in the system. These included awareness of the destination marketing system opportunities, credibility and trust of the organisation operating the destination marketing system, lifestyle motivations of the tourism operators, and perception of the benefits of the destination marketing system. Essentially, the usefulness of destination marketing systems to consumers, and therefore their overall success, hinges on participation by the tourism operators. Further research is required to uncover the reasons behind the low participation of destination marketing systems and how the obstacles can be overcome.

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KEY TERMS

Cooperative Marketing: The act of working together to conduct activities associated with buying and selling products or services.

Database: An organised collection of data and information stored in a computer medium that can be easily accessed and manipulated.

Destination Marketing System: A computerised information system that is used as a marketing tool, usually to distribute information on tourism attractions and tourism products for a particular geographical destination to potential visitors.

Potential Visitor: Someone who may, in the future, travel to the destination for business or pleasure.

Stakeholder: A party with significant importance to the success of the destination marketing system.

Tourism Supplier: A business that supplies a tourism product for consumption by tourists. These may take various forms, such as transport, attractions, events, accommodations, or hospitality.

Web Site Marketing: Conducting activities associated with buying and selling products or services using a group of Web pages that collectively represent a company, in this case, a destination, on the World Wide Web.

Developing Regional Tourism Using Information Communications Technology

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INTRODUCTION

Tourism and hospitality industries are heavily reliant on the effective exchange of information between suppliers, intermediaries, regulatory and marketing agencies, and consumers (Sheldon, 1999). Many technologies may be employed to facilitate this exchange, with the selection of the most appropriate technologies in any given circumstance depending on issues such as the proximity of agents; the extent to which information is dynamic; and the application of information as part of business or decision-making processes.

In regional tourism [i.e., that which occurs outside major capital cities, domestic source markets, or international tourism gateways (Kelly, 2003)], suppliers, intermediaries, facilitators, and consumers are likely to be highly dispersed (Carson, Sharma, & Waller, 2003). Information is likely to be dynamic, as tourists respond to seasonal changes in product offerings. A lack of critical mass of products and consumers in regional areas (Carson, Richards, & Rose, 2004) heightens the importance of effective information exchange, as businesses have fewer opportunities to draw on local markets to make up for any market instability that may result from poor communication.

Information and communications technologies (ICT) and, specifically, online technologies, offer potential for improving communication effectiveness, which may be defined to include accuracy, reliability, timeliness, and accessibility of information exchange (Carson & Sharma, 2002). While these technologies may be employed by businesses operating in regional destinations, it is important to recognize that regional destinations tend to operate as tourism systems (Leiper, 1995), with close connections between organisations in the private, public, and community sectors required to take advantage of the economic, social, and environmental benefits of tourism while minimizing the negative consequences. As an ICT issue, then, the question is not simply how can tourism businesses best employ the technologies for their individual sustainability, but how can regional tourism systems as a whole effectively employ ICT (Carson & Richards, 2004)?

Despite the substantial potential, and the growing role played by ICT (particularly online technologies) in the regional tourism destination development, Alford (2004) provided strong evidence that many systems have failed to meet expectations. Project costs, particularly in the implementation phase, have been poorly assessed, and there has been a high rate of project failure. Alford suggests that technology-driven approaches to decision making have a poor record of success and proposes the use of critical theory to increase the understanding of ICT issues. This approach recognizes that technology inevitably interacts with "the real world" and that real-world constraints are more important to the outcome of technology projects than their technical merits.

This article is concerned with proposing a framework that may assist regional tourism destinations to incorporate some real-world thinking in making decisions about what types of ICT to implement and support. It also describes some of the broad international trends in ICT and tourism that may influence the adoption of technology. The article is based on a five-year research program in Australia that has included case studies of technology adoption by a variety of organisations that participate in regional tourism systems in Australia (see, for example, Carson, Taylor, & Richards, 2003; Carson, Sharma, & Waller, 2003; Sharma & Carson, 2002), and a review of the international literature addressing tourism and ICT adoption generally. The article argues from the standpoint that regional tourism systems and their component organisations need to make careful decisions about what technologies to implement, and how these may best be employed. Furthermore, substantial barriers to technology adoption persist in many regional areas, and these will need to be addressed to allow tourism to reach its potential as an economic driver, particularly in developing countries and depressed rural economies (Kelly, 2002).

A FRAMEWORK FOR REGIONAL TOURISM TO EMPLOY ICT

Throughout the late 1980s, researchers such as Buhalis (1998, 1997), Sheldon (1999), and Werthner and Klein (1999) suggested that ICT and, in particular, online technologies, would become more widely depended upon by tourism businesses, consumers, and intermediaries to manage relationships between these agents. ICT may

therefore facilitate relationships between business and consumer, business and business, and business and government. There are additional relationships between government and government and consumer and consumer (for example, chat rooms) that have been facilitated by ICT but are not considered in this paper. Likewise, consumer and government relationships have been enhanced through initiatives such as Australia's Electronic Travel Authority System, which allows for online processing of visa applications for many international visitors (Sustainable Tourism Cooperative Research Centre, 1999).

Carson and Sharma (2001, p. 121) proposed an online architecture as a guide for tourism businesses in assessing their ICT needs, and then matching tools and applications to those needs. The online architecture suggests that organisations (primarily, but not exclusively, private firms) need to consider their information exchange needs in relation to communication, research, promotion, product distribution, and management functions. The online architecture emphasizes that technology can only be effective if its use enhances the ability to perform business functions. The best technology is not necessarily that which is newest to market or that which contains the greatest number of features. The best technology is that which most closely matches the business needs of the

purchasing agent. The online architecture provides a framework for assessing that match.

Figure 1 is a refinement of the online architecture proposed by Carson and Sharma (2001). It encompasses the five components of technology application described by Carson and Sharma, and also includes a set of influences on the specific technology mix for an enterprise or, in the context of this article, a destination. Four influences are identified as being consumers, technical expertise, public policy and infrastructure, and suppliers and business partners. Within each influence are conditions that act upon the capacity for regions to choose an online architecture. Conditions may include financial, human, and time costs (technical expertise), public investment and access to infrastructure, the nature of regional collaboration, as well as the preferences of consumers.

It may not be that each of the four influences described in Figure 1 have equal weight in implementation of a regional online architecture. Some of the conditions (for example, access to adequate infrastructure) may be prerequisite, while others (such as the compatibility of online systems of business operation with offline systems) may exert degrees of influence. While the framework in Figure 1 may assist regions in scoping their general online architecture requirements, decisions about specific tech-

Figure 1. Influences on the online architecture
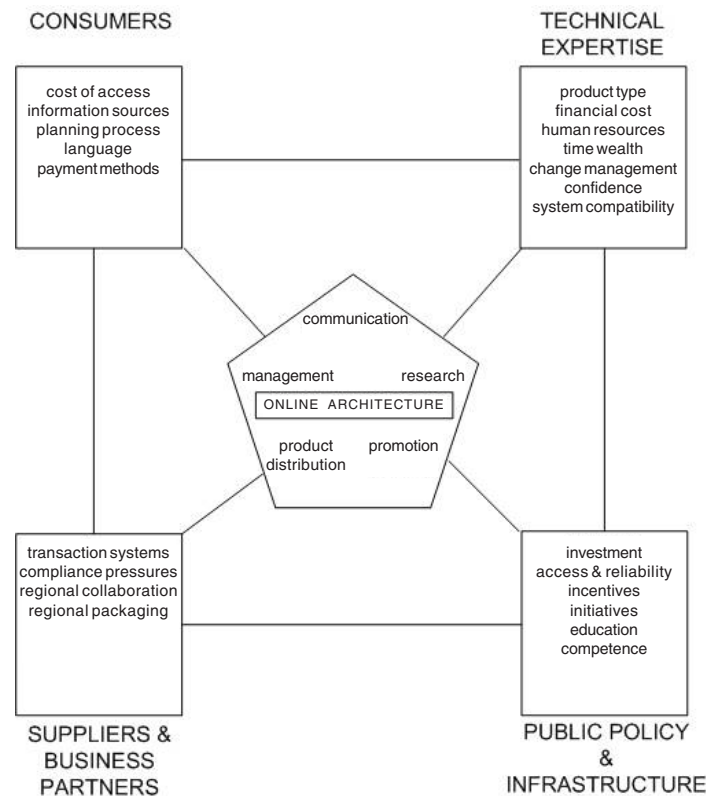
nologies, applications, and management approaches are driven by the cues listed as follows:

Communication

- What networks require maintenance through communication?
- Who are the targets?
- How often and when do I communicate with them?
- What is the format of the communication?
- What technologies do my targets have, and what technologies do they plan to use?

Research

- What information do I need?
- When do I need it?
- What costs do I incur currently in getting that information?
- Is the information available online?
- What are the costs of getting this information online?

Promotion

- Who is the intended audience?
- What is the message?
- What action do you expect the audience to take having received the message?
- Can they take this action online?
- How do you measure the impact of the message?

Product Distribution

- What am I selling?
- Who am I selling it to?
- When is it normally paid for?
- What are the costs of accessing e-commerce models (in-house, outsourcing, etc.)?
- What inventory management systems do I have?

Management

- What management functions do I need to perform (banking, recruitment, staff training, compliance, etc.)?
- How often do I perform them?
- Are there resources online?
- What is the cost of accessing them compared to the current cost?

The research by Sharma and Carson (2002) showed that businesses that undertook a formal or informal program of ICT planning that considered each aspect of the online

Table 1. Potential ICT responses to an online architecture for regional tourism (Sharma & Carson, 2004; Carson & Richards, 2004; Knoblock, 2004; Christou et al., 2004; La Micela, Roberti, & Jacucci, 2002; Maidche & Staab, 2002; Flouri & Buhalis, 2004)

Business Function	Business and Consumer	Business and Business	Business and Government
Communication	• E-mail distribution lists • Automated telephone systems	• AFTA WebMAIL* (Australia)	• Online travel advisory systems
Research	• Software agents • Semantic Web applications	• Decipher* (Australia) and similar international ventures	• Business Entry Point* (Australia)
Promotion	• 'Brochure ware' destination marketing Web sites at enterprise, local, regional, state/province, and national levels • Visitor Centre touch screen kiosks • In-flight and in-room interactive media	• B2b Web sites	• Australian Tourism Data Warehouse* (Australia)
Product Distribution	• Online travel auctions • 'Last minute' online booking services • E-ticketing • Smartcards • Wireless technologies	• Transfer of traditional global distribution systems to online platforms	• PICO* (Italy)
Management	• Customer Relationship Management (CRM) software • Event management software • Accommodation management systems (e.g., Fidelio)	• Digital training assistants • Inventory management systems	• Electronic tax systems • Online license applications

architecture were more likely to persist with technology implementation, and to self-assess their ICT strategies as highly effective for their businesses. Those who used a more technology-driven process of planning (based on "what was possible" rather than on "what was required") tended to perceive more barriers to implementation, and to suffer greater rates of withdrawal from their ICT tools and applications. Of course, all elements of the online architecture are essentially concerned with communication, and in a regional setting, may contribute to the maintenance of networks and relationships both within a region and between a region and other elements of the tourism system.

The Australian research described by Sharma and Carson (2002), and a review of key international literature in the field, has identified a range of ICT tools and applications that have been developed specifically for tourism or that have found particular application in regional tourism destinations. Table 1 identifies some of these initiatives to provide a sample of the ways in which ICT has been employed to facilitate regional tourism development. Initiatives marked with an asterisk are described in brief below the table.

- **AFTA WebMAIL:** WebMAIL is an online information management system for travel agents in Australia (AFTA is the Australian Federation of Travel Agents). WebMAIL collects and collates product offerings and announcements from participating industry suppliers across Australia, and provides a single point of access to these for registered travel agents. The system has been instrumental in assisting travel agents in managing the high volume of daily information (special deals, new packages, etc.) they have received by fax and individual e-mail in the past (Sharma & Carson, 2004).
- **Decipher:** Decipher is an Internet-based "one-stop shop" for tourism research and business intelligence aimed at the Australian tourism industry. It stores publications, tables, maps, and other information packets in a central location and provides access to these through a series of knowledge products (such as business planning and marketing tools) and search functions (Carson & Richards, 2004). Decipher has similar aims to technologies under development or currently implemented in Austria (Woeber, 2003), Canada (Waksberg, Stevens, & Vales, 2000), Spain (Navaro & Rubio, 2000), and in the state of Illinois in the United States (Gretzel & Fesenmaier, 2002).
- **Business Entry Point:** The Business Entry Point is an online information service for small firms in Australia. It provides assistance with licensing and accreditation requirements, and assists in business planning and compliance.
- **Australian Tourism Data Warehouse:** The Australian Tourism Data Warehouse is one example of a national-level tourism product database used for online promotion purposes. The Data Warehouse brings together state and regional product databases using a common data structure and ontology.
- **GDS:** Global distribution systems are used by airlines, travel agencies, and other intermediaries to manage product inventory and to sell tourism products and packages. In the past, these have been dedicated line electronic services, but virtually all of the major GDSs (Amadeus, SABRE, Galileo, etc.) have migrated to online systems.
- **PICO:** PICO is the *Project of Innovation by means of Cooperation* that has used ICT applications in destinations in northern Italy to create a series of forums and information-exchange vehicles to assist local tourism organisations to work together as a single virtual tourism organisation (La Micela, Roberti, & Jacucci, 2002).

CONCLUSION: DEVELOPING REGIONAL TOURISM DESTINATIONS USING ICT

It is clear from Table 1 that there is a wide range of ICT applications that have either been specifically designed for tourism or that have substantial use among tourism organisations. Many of these have clear advantages for enterprises and intermediaries involved in regional tourism, as they help address issues of isolation, geographic dispersal, lack of critical mass of enterprises and consumers, and management of dynamic information. Carson, Richards, and Rose (2004) have argued that for regional tourism destinations to gain a competitive advantage, they need to work collaboratively. One feature of that collaboration may be the sharing of ICT resources and infrastructure to achieve common purposes, such as accessing markets, maintaining relationships with suppliers and tour packagers, managing customer relations, or accessing business intelligence and research.

A review by Sheldon (1999) indicated that the larger enterprises, particularly airlines and accommodation chains, have been at the forefront of ICT adoption in tourism. The increasing reliance on applications such as GDS by these sectors has then flowed down to other sectors, most notably, travel agents and other intermediaries. Regional destinations tend to have fewer large enterprises and have therefore lacked the technology demonstrators and lead users that may facilitate adoption. In some countries, including Australia, government programs have attempted to address this issue by offering incentives and education for regional tourism enterprises and organisations to encourage technology uptake (Sharma & Carson, 2002). In some cases, these programs have clear ideas of how regional tourism enterprises should use technology, and these ideas are often formed from experience in metropolitan areas or the claims of ICT manufacturers and distributors. Experience suggests (Carson, Sharma, & Waller, 2003) that regional enterprises often find their own ways of using ICT that may be different from those envisaged. For example, there has been a relatively low rate of uptake of Web-based commerce by Australian regional tourism enterprises if that commerce is assessed in terms of the number of enterprises with their own, e-commerce enabled Web sites. Instead, smaller regional enterprises have engaged collaboratively with private-sector e-commerce portals such as *wotif.com.au* and *lastminute.com*. Engaging in this way has reduced the individual costs of adoption and helps to manage the ongoing issues of poor ICT infrastructure in many regional destinations around the world.

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ICT has proven to be an effective tool in assisting regional tourism destination development. The employment of a decision-making framework such as the online architecture described in this paper may contribute to ongoing innovation in ICT use. Significantly, while there may be a focus on individual enterprises selecting and implementing ICT, the collaborative aspect of regional destinations must also be considered. Many ICT applications offer collaborative solutions to the communication, research, promotion, product distribution, and management needs of regional tourism enterprises and destination managers. Effective implementation of online architecture, however, requires attention to the needs and resources of consumers, enterprises, policy makers, infrastructure providers, and business partners. Alford (2004) recommended a communicative and collaborative approach to planning implementation projects for ICT in tourism, and the online architecture offers some cues for managing that communication.

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KEY TERMS

Accommodation Management Systems: Integrated software (desktop, network, or Web-based) to assist a variety of functions for accommodation establishments. This may include reservations, room maintenance, banquet booking, finance, and customer relationship management.

Destination Marketing Organisation (DMO): Public-sector organisations charged with the promotion of a destination. They may operate at local, regional, or national level, and often include membership from private-sector organisations.

Destination Marketing Web Site: Web site featuring information about individual products and generic information about a local, regional, or national destination. These sites may be purely for promotion or may include e-commerce facilities for booking and purchasing product. They may be managed by DMOs or by private firms or industry associations not affiliated with a DMO.

Event Management Software: Integrated software (desktop, network, or Web-based) to assist a variety of functions for event managers. This mayinclude venue booking, delegate registrations, speaker requirements, transport, and accommodation management.

Global Distribution Systems: Global distribution systems are used by airlines, travel agencies, and other intermediaries to manage product inventory and to sell tourism products and packages. In the past, these have been dedicated line electronic services, but virtually all of the major GDS (Amadeus, SABRE, Galileo, etc.) have migrated to online systems.

Intermediaries: In the tourism and travel sectors, intermediaries are those organisations that package or on-sell product. These include travel agents, tour packagers, inbound tour operators, and destination marketing organisations. The Internet has led to the emergence of electronic intermediaries that offer their services entirely online.

Online Architecture: An organisations' online architecture demonstrates the range of functions they perform, or intend to perform, using online or other information technologies. Functions may pertain to communication, research, promotion, product distribution, or enterprise management.

Regional Tourism Systems: The combination of organisations and institutions with an interest in the management of tourism in a given destination. Regions may be defined by administrative boundaries or by communities of interest.

Smartcard: Card system that allows visitors to prepurchase products or product "credits" and to use the card at venues and attractions (such as hotels, theme parks, tours, etc.) in lieu of direct payment.

Digital Divide and the ICT Paradigm Generally and in Estonia

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TECHNO-ECONOMIC PARADIGMS

A multitude of writings have appeared since the 1970s describing how societies have undergone "information revolutions" (Bell, 1973; Castells, 1998; Masuda, 1981), "the third wave" (Toffler, 1980), etc. Indeed, ICT development has been explosive in both developed and developing countries since the 1990s. This, in turn, has given some countries an opportunity for bigger economic growth; attempts have been made in a majority of countries to rearrange the organization of the public sector, and individuals have experienced a rise in the quality of life due to the introduction of new technologies.

Yet, there is a growing understanding that similar "revolutions" have happened before in human history. According to the widely accepted theory of techno-economic paradigms, similarly to scientific paradigms (Kuhn, 1962), there are also technological paradigms that determine the technological problems, scientific principles, and material technologies to be used as well as the whole socioeconomic reality (Perez, 2002, Perez, 1985). These techno-economic paradigms have occurred in waves or cycles, named after the Russian economist Kondratjev who discovered them. This has been developed further by Schumpeter (1939), Freeman (Freeman & Louçã, 2001), and, in particular, by Carlota Perez (2002), and has become to be known as the Schumpeter–Perez–Freeman thesis.

From previous paradigms, we know that, for example, cotton, coal and iron, steel, oil, and plastic have been in the center of technological innovations of all-embracing influence in the production sphere. Once a dominant pattern, a new common sense, is established, there is a period of broad stability, in which the innovation process conforms to a common set of criteria, and the design of technological artifacts changes in an incremental, evolutionary manner. In order to bring along a techno-economic paradigm change, the radical innovations together with incremental innovations give rise to new technology systems, fueled by the financial sector, and affecting the entire economy. Although the former technology is physically as productive as before, its relative attractiveness is seriously diminished, because industries that carry the new paradigm show greater profit potential. The financial effect of these paradigm changes is that it is simply not lucrative anymore to invest in "old economy" fields, which means that capital is siphoned out of them, even if they were still productive "as such." All these industries, however, end up being modernized by the new paradigm, through the introduction of the generic technologies (as ICT now) and the new organizational models, which offer superior productivity across the economy. The social effect of all these change processes includes the creation of a demand for new structures in labor and education, and the dismantling of the old ones, as well as changes in key social and cultural patterns of life (e.g., urbanization, mobility, networks). This also challenges the basis of the political sphere, in that changed participatory structures transform the political cohesion of a community.

In this context, there is a reason to view ICT as a technology leading the techno-economic paradigm of the whole world. What should also be mentioned about this wave is that even those who have disputed the revolutionary character of earlier waves of technical change often have little difficulty in accepting that a vast technological revolution is now taking place, based on the electronic computer, software, microelectronics, the Internet, and mobile telephones (Freeman & Louçã, 2001, p. 301). Starting with the technological revolution, followed by the financial bubble and collapse, we are currently midway into the ICT wave, entering the "Golden Age" and probably with 20 or 30 years of deployment ahead (Perez, 2002).

DIGITAL DIVIDE

The changes in and development of the new techno-economic paradigm, thus have both winners and losers. Namely, some countries, population groups, and persons adapt to changes more easily, and others are more passive or even work against the changes. That is why the main function of the state is to analyze the challenges brought about by the techno-economic paradigm and to change and reform the existing policy measures and institutions accordingly so as to again involve those who have become the losers in the economic development and social life. Although the primary goal is to ensure the emergence of new (ICT-based) branches of industry and the upgrading of existing industries (particularly by employing inno-

vative activities and by supportive industrial and technology policies) and related employment patterns, the risks involved in the paradigm change should not be underestimated.

The term "digital divide" refers to one of the dangers brought about by the emergence of the ICT paradigm and is understood as the gap between individuals, households, businesses, and geographic areas at different socioeconomic levels with regard both to their opportunities to access information and communication technologies and to their use of the Internet. The digital divide reflects various differences among and within countries (OECD, 2001, p. 5). In the context of the ICT paradigm, it refers to a situation where part of the population (or countries) is being or about to be excluded, because of an existing or emerging digital divide, from further economic and social development and well-being that is brought about by ICTs.

Hence, the digital divide is a complicated question by its nature, as it involves economic (why and how existing ways of business change), social (e.g., user motivation), and other issues. Thus, in order to fully deploy the enormous wealth-creating potential brought about by the ICT paradigm, governments are obliged to change, reform, and readjust institutions and the environment (legislation, the educational and taxation systems, etc.), and to demonstrate innovation in policy making. This is the government's responsibility, as it is only the state/government that can do it, and only the government has the necessary legitimacy. Doing nothing can lead only to retardation of economic and social development.

DIGITAL DIVIDE IN ESTONIA

Estonia is one of the smallest European Union member states (member since May 2004) with a population of 1.4 million. The regaining of Estonia's political and economic independence from the Soviet Union took place in August 1991. Since then, various international reports on information society development have given Estonia credit for a good ICT infrastructure and a decent online environment. Indeed, Estonia has succeeded in building up modern telecommunications infrastructures, computerizing the secondary education sector, making progress with the regulatory environment, and setting up several large-scale programs initiated by the government, nongovernmental organizations (NGOs), and the private sector. An example of the supportive environment is the fact that as of spring 2004, Estonia was the only country in the European Union with an e-voting law for national elections actually in place and technological solutions in development.

Surveys from 2004 indicate that 49% of the Estonian inhabitants between 15 and 74 are using the Internet. Compared to 2003, an additional 4% of the Estonian population of that age group has become Internet users. In Estonia, where rapid changes have taken place in all fields, the issue of the digital divide has not received much attention, although several empirical surveys indicate that the problem does exist in the country: namely, since the year 2001, the previous years' impressively steep

Figure 1. Growth of Internet users in Estonia
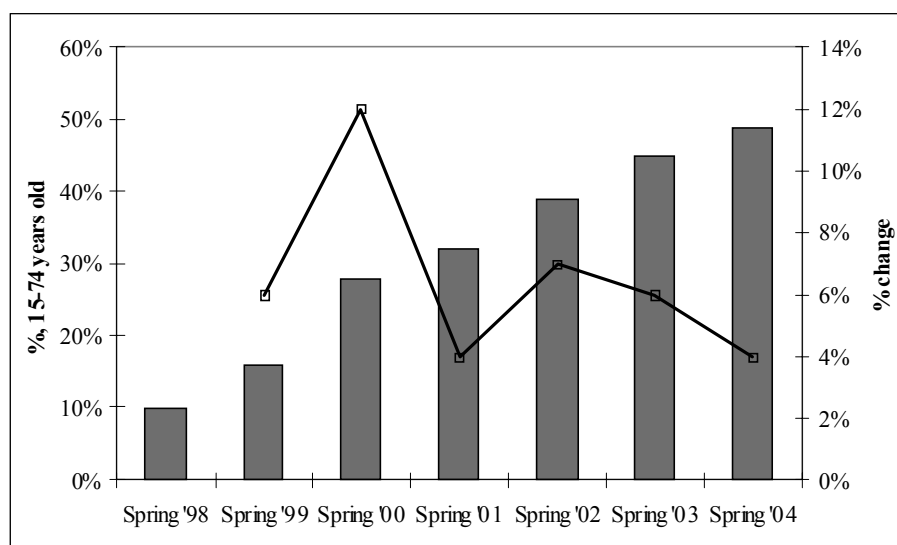
Source: TNS Emor, e-Track, 1998-2004.

increase in the numbers of Internet users has not shown signs of further steep growth (Figure 1).

With the intention to focus more on the social dimension of the information society, a thorough study was carried out in 2002 by TNS Emor and PRAXIS Center for Policy Studies at the order of, with funding from and in direct partnership with the Look@World Foundation, the Open Estonia Foundation, and the State Chancellery. The study was cofinanced by the infoDev Program of the International Bank for Reconstruction and Development, and the Open Society Institute–Budapest. The study consisted of an identification of segments of the population regarding their use of the Internet and an in-depth study of them using focus group interviews. In addition, interviews with experts were carried out who evaluated Estonia's overall ICT developments so far, the role of the digital divide in society, and its causes, and made suggestions for potential involvement of the risk groups (for full details of methodology and complete results, see Kalkun & Kalvet, 2002).

There are "Blue Collars" and "Passive People" among the Nonusers of the Internet

The report of the value orientations survey indicated that nonusers of the Internet accounted for 58% of the Estonian population in the 15 to 74 age bracket, i.e., an estimated 607,000 people (2002). There are two distinct categories in the group of nonusers: "Passive People" and "Blue Collars" (these titles are generalizing terms; the names are derived from the value orientations study, taking into account the mentality and socio-demographic background of the people forming the groups).

"Passive People" (28% of nonusers of the Internet) are characterized by the following:

- About 60% of the people in this group are 50 or older.
- They have relatively little interest in matters outside their daily life.
- Their relation to the Internet or to computers is very weak, they neither see any benefits in the Internet nor do they have any need to use it.
- They prefer to use the traditional media (even if the Internet were cheaper and more convenient), as apart from their general display of a lack of interest, they are constrained by the language barrier and are unable to handle the user interfaces of computers. They are also relatively less incapable of learning and memorizing new things and unwilling to change their habits.

"Blue Collars" (27% of nonusers of the Internet) are characterized by the following:

- They are mainly unskilled and skilled workers who do not need computers at their jobs.
- About half of the people in this group see no benefits in the Internet and are not willing to change their daily routines, as the Internet is unattractive to them.
- A personal monetary gain would make the Internet attractive to them.
- There are social and psychological barriers (dread of new technologies, no recognition of the need for lifelong learning, a fear to reveal to other people one's lack of skills), skills barriers (lack of computer and foreign language skills), and economic barriers (income per family member is at the Estonian average level).

So far, these groups have not perceived a connection between their lives and the Internet. Contrary to that, members of the "Experimenters" (the group is so titled because the people forming it are characterized by a desire to try everything that is new) and "Other nonuser groups" (more heterogeneous group with regard to the mentality of its members, which is why its title does not refer to any particular way of thinking) already have motivation to use the Internet.

It can be claimed with reasonable certainty that the socio-demographic characteristics of members of the Estonian population segments who do not use information technology were fairly similar to those of other countries. Differences in income, education, and age are referred to as the reasons for the digital divide everywhere (see also Foley, 2000; Kai, 2001; National Telecommunications and Information Administration and the Economics and Statistics Administration, 2002).

Main Barriers Leading to Nonuse of the Internet

The *motivational barrier* is the main barrier in the Estonian society and consists of the perception that the possibilities offered by the Internet are not associated with personal needs. The understanding that "computers are not for me" still prevails. One of the reasons underlying this belief may be the Internet access structure in Estonia: as the living standard is relatively low, comparatively few people have computers at home, and due to the education sector computerization program, schoolchildren are above-average users of the Internet. Also, together with the adoption of Western styles of work, various institutions quite abruptly switched to computers. Due to these tendencies, the prevailing view is that computers are only useful to and needed by either children for doing their school assignments or adults on their job.

In addition, there is distrust of e-services. Namely, no time gain is perceived, especially in performing public services. There is a strongly held belief that no results can be achieved when affairs are managed from a distance and instantaneously. Public-sector services are perceived in a very personalized way (the process is not distinguished from the person offering the service; one particular civil servant is seen as a gatekeeper; every civil servant is believed to require different documents). In the management of personal affairs, the only perceived Internet partner is the e-bank. Therefore, there are grounds for assuming that if alternatives comparable to e-services are available, and if the use of an e-product/service does not prove revolutionarily attractive (the price of the technology enabling the use of e-services is high, but the added value of an e-product/service is low), then even properly targeted content services may fail to sufficiently motivate people to become Internet users.

It also followed from the survey that there was a lack of relevant information content. However, merely making a few services available on the Internet will not, as a rule, help increase the number of Internet users. The area that is very likely to attract masses of new users if offered via the Internet is health care. This is so because, on the one hand, various health care services (provided by doctors and dentists as well as pharmacists) are the ones that people need most frequently, and on the other hand, they have to go through several troublesome procedures before they can get these services. A specific barrier in the Estonian society is the small number of Russian-language Web sites and Internet services concentrating on Estonian issues.

Of all nonusers of the Internet, 26% put their nonuse down to either their *poor computer skills or the complexity of use*. The Internet appears to be complicated, because the computer and the Internet are hard to master, in view of the language and memory problems involved and the poor opportunities for practicing, which, in turn, feeds the dread that either the expensive hardware or its user may get damaged in one way or the other (for instance, money can be transferred inadvertently to a wrong account).

Both "Blue Collars" and "Passive People" have strong social fears of learning in a group or using the Internet in a public place: they are apprehensive about falling behind with their learning and are reluctant to reveal their lack of skills.

Today's nonusers of the Internet would like to use the Internet at home, which is usually not possible, and thus, the *access barrier* exists. Public Internet Access Points (PIAPs) are not suitable due to both inconvenient opening hours and an unwillingness to demonstrate one's lack of skills publicly. However, the most important, though hidden, reason seems to be the unwillingness to change one's habitual routine (home–work–supermarket–home for "Blue Collars"; home–post office–supermarket–home for "Passive People"). Since neither "Blue Collars" nor "Passive People" wish to change their daily routines, the existing PIAPs cannot be expected to help attract a majority of them to the Internet.

Policy Recommendations

The research conducted showed that both in view of effectiveness and of guaranteeing more extensive economic and social development, it is reasonable to focus on the "Blue Collars" group, for whom the problem of motivation is central at the moment.

In order to guarantee a rational use of the Internet by the present nonusers, especially by "Blue Collars," it is necessary to make them believe that the Internet is precisely the channel they need for doing daily errands. This, in turn, would presuppose an internal reorganization of the public-sector's work, in order to not disappoint the users and to avoid further consolidation of the opinion that it is impossible "to manage things from a distance and instantaneously."

Considering the share of the non-Estonian-speaking population in the group, making the existing public- and private-sector information content and services available in Russian would be highly effective if accompanied by a relevant advertising campaign.

Overcoming the skills barrier is also of great importance in the case of "Blue Collars," because even if they have a computer at home, their children may be its only users. The best place for training is the workplace; as the unemployed are one of the groups of nonusers, direct pressure by the state to involve these people in training would be effective (for example, a more extensive Internet training program as part of conversion training).

As PIAPs in their present form do not satisfy "Blue Collars," an effective solution would be the creation of specialized PIAPs (SPIAPs) in places easily accessible to "Blue Collars," who would then be surrounded by people like them.

In order to bring *"Passive People"* closer to the Internet, a broader understanding of the notion of "Internet for everyone" has to be promoted, with the motivational barrier being the main barrier to "Passive People" who believe that "computers are not for me." To remove this barrier, it has been suggested that media productions such as TV series, etc., that enjoy great popularity among "Passive People" be exploited.

Only after the broad social barriers have been removed, can more specific services become more attractive to the current nonusers. The area of activity that may attract new users if made available on the Internet is health care (beginning with consulting a doctor and ending with

receiving medicine from a pharmacy), and hence, the availability of a complex service on the Internet may attract new users.

Apart from an appropriate advertising campaign, SPIAPs must be created for this group at their points of gathering (hobby clubs), and, if possible, also in post offices (which might be quite effective if post offices agreed to introduce special services and provided hands-on training).

CONCLUSION

It is obvious that our economic and social reality is currently guided by the ICT-based techno-economic paradigm. It is also clear that some countries, population groups, and persons that have adapted to changes more responsively have already obtained productivity gains, more sustainable employment patterns, and greater social cohesion. However, the issue of the digital divide has become a central issue in many countries.

Estonia has enjoyed a very rapid information society development, but for achieving economic development and social cohesion, the issue of the digital divide needs to be addressed urgently. Among nonusers of the Internet in Estonia, there are two large groups—"Passive People" and "Blue Collars"—and the main barriers that lead to nonuse of the Internet are related to motivation, skills, and access. If "Blue Collars" are not integrated into new employment structures, the ICT-based upgrade of many economic sectors will be impossible. As argued by the concept of techno-economic paradigms, however, such an attitude toward new technologies will only strengthen economic and social problems over time.

Although the research and policy recommendations have been based on the Estonian case, it is reasonable to assume that the issues as well as the policy options in other transition and developing countries are quite similar. Namely, governments are obliged to change, reform, and readjust institutions and the environment and to demonstrate innovation in policy making to avoid the digital divide.

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KEY TERMS

Access Barrier: A factor contributing to the digital divide in Estonia. Nonusers of the Internet would like to use the Internet at home, which is usually not possible. Public Internet Access Points are not solving access issues due to both inconvenient opening hours and an unwillingness to demonstrate one's lack of skills publicly.

"Blue Collars": A group of Internet nonusers in Estonia, whose mentality and socio-demographic background are similar. They are mainly workers who do not need computers in their job. About half of the people in this group see no benefits in the Internet and are not willing to change their daily routines. There are social and psychological barriers (dread of new technologies, no recognition of the need for lifelong learning, a fear to reveal to other people one's lack of skills), skills barriers (lack of computer and foreign language skills), and economic barriers (income per family member is at the Estonian average level).

Digital Divide: The gap between individuals, households, businesses, and geographic areas at different socioeconomic levels with regard to both their opportunities to access information and communication technologies and their use of the Internet. The digital divide reflects various differences among and within countries.

Motivational Barrier: The main factor contributing to the digital divide in Estonia. There is a perception that the possibilities offered by the Internet are not associated with personal needs. Distrust of e-services exists, as no time gain is perceived, especially in performing public services. Lack of information content is another subfactor.

"Passive People": A group of Internet nonusers in Estonia, whose mentality and socio-demographic background are similar. About 60% of the people in this group are 50 or older, and they have relatively little interest in matters outside their daily life. Their relation to the Internet or to computers is very weak, they neither see any benefits in the Internet nor do they have any need to use it. They prefer to use the traditional media (even if the Internet were cheaper and more convenient), as apart from their general display of a lack of interest, they are constrained by the language barrier and are unable to handle the user interfaces of computers; they are also relatively less incapable of learning and memorizing new things and are unwilling to change their habits.

Skills Barrier: A factor contributing to the digital divide in Estonia. The Internet appears to be complicated, because the computer and the Internet are hard to master, in view of the language and memory problems involved and the poor opportunities for practicing, which, in turn, breeds the dread that either the expensive hardware or its user may get damaged in one way or other (for instance, money can be transferred inadvertently to a wrong account).

Techno-Economic Paradigm: Best-practice model made up of a set of all-pervasive generic technological and organizational principles that represent the most effective way of applying a particular technological revolution and of using it for modernizing and rejuvenating the whole economy and social sphere. When generally adopted, these principles become the common-sense basis for organizing any activity and for structuring any institution.

Digital Libraries and Development for the Illiterate

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INTRODUCTION: A DIVIDED WORLD

Even though the information revolution is usually traced back to the 1960s in the United States with the convergence of ICT, it was only in the last two decades that these technologies diffused to most developing societies around the globe, allowing interactive and simultaneous transfer of information in real time. And it was not until the mid-1990s that the Internet became a worldwide phenomenon.

Despite rapid technological changes, in the early 1990s, more than 1 billion people, one-fifth of the world's population, still lived on less than one dollar a day—a standard that Western Europe and the United States attained 200 years ago (World Bank, 1991). Technological progress and social progress had not been a reality for the majority of the population in the developing world. The rate of progress in technological development was in sharp contrast to the rate of progress of social development. By 1999, nearly 1.3 billion people still lived on less than a dollar a day, and close to 1 billion could not meet their basic consumption requirements (UN, 1999). Three decades after the "widening gap between developed and the developing countries" was recognized by the United Nations as the "central problem of our times," the income gap between the world's richest fifth and poorest fifth had more than doubled, to 74 to one (UN, 1999).

In the early 1990s, digital information technologies were being hailed as the technologies that would transform developing economies. On the production side, it seemed like the developing world could be a player: software was being developed in places like Bangalore in India, and computer chips were manufactured by Costa Rica for Intel. As barriers to connectivity diminished, the prospectus that information technologies would assist in fighting poverty was bright. By the end of the decade, revenue generated by the production of information and communication technology (ICT) goods (like office equipment, telecommunications, and consumer audiovisuals) showed the United States as the absolute leader in the world (OECD, 2000a). In 1997, the OECD reported that even though industrialized countries accounted for more than 80% of the world market for ICTs, expenditures in non-OECD countries such as Brazil and China had been growing at more than double the OECD average (OECD, 1997).

Furthermore, the 1998/1999 World Bank Report included many examples of how ICTs were making a difference in the developing world. In spite of these trends and many more examples, both the UN and the World Bank acknowledged the existence of a "divide":

- Geographic barriers may have fallen for communications, but a new barrier has emerged, an invisible barrier that is like the World Wide Web, embracing the connected and silently—almost imperceptibly—excluding the rest. (UN, 1999, p. 1)
- If knowledge gaps widen, the world will be split even further, not just by disparities in capital and other resources, but by the disparity of knowledge. Increasingly, capital and other resources will flow to those countries with the stronger knowledge bases, reinforcing inequality. There is also the danger of widening knowledge gaps within countries, especially developing ones, where a few fortunate surf the World Wide Web while others remain illiterate. (World Bank, 1998, p. 14)

As Arunachalam (1998) says, the Internet "is failing the developing world." The term "digital divide" was coined during policy discussions held for the U.S. Telecommunications Act of 1996, which was designed to ensure every American eventual access to advanced telecommunications services and more immediate access to basic telephone service. Since then, the term has broadened and been defined as differences in access to all digital information and telecommunications technologies, including the Internet. More recent definitions focus on describing the divide itself, by, for example, classifying it into several divides:

The digital divide is a multidimensional phenomenon encompassing three distinct aspects. The global divide refers to the divergence of Internet access between industrialized and developing societies. The social divide concerns the gap between information rich and poor in each nation. And lastly within the online community, the

democratic divide signifies the difference between those who do, and do not, use the panoply of digital resources to engage, mobilize and participate in public life. (Norris, 2001, p. 1)

Other definitions, such as the following, focus on describing the effects created by the divide (or divides):

The digital divide refers to social stratification due to unequal ability to access, adapt, and create knowledge via use of information and communication technologies. (Warschauer, unpublished manuscript, 2001, p. 1)

Several characteristics stand out from these two definitions. First, the global digital divide is not simply the difference between countries with or without access to the Internet. Second, in spite of being caused by the use of digital ICTs, the divide is not binary, rather it is a complex social multidimensional phenomenon created by the access, or lack of access, to these technologies. Third, from a global perspective, the divide may be deepening prevailing differences between developed (postindustrial) and developing countries. For our purposes, the global digital divide is defined as the gap established due to unequal capacity among countries to access, adapt, and create knowledge via the use of digital ICTs. The global digital divide may be exacerbating differences among countries, but also within countries. In sum, when referring to the global digital divide, we are referring to the digital divide among countries, whereas the social digital divide is the social stratification created by the digital divide within a country.

This phenomena added new questions to the development puzzle: In what way is the global digital divide affecting the quality of life of individuals in the developing world? Had the exponential pace of ICTs mainly served to benefit the postindustrial countries? Or had it created opportunities for "leap-frogging" development stages for developing countries? If there was such a thing as a "digital divide," was it expanding or was it closing?

DIGITAL LIBRARIES

Inequalities among countries due to differences in their capacities to access information and knowledge have always existed. Whereas in 1998, a U.S. medical library subscribed on average to about 5,000 journals, the Nairobi University Medical School Library, long regarded as a flagship center in East Africa, received only 20 journals (compared with 300 a decade ago). In Brazzaville, Congo, the university had only 40 medical books and a dozen journals, all from before 1993, and the library in a large

district hospital was a single bookshelf filled mostly with novels (UN, 1999).

The new component in the already unequal capacity among countries to access knowledge is the new type of digital infrastructure required to increase a country's capacity to access knowledge. The infrastructure required to bridge the divide created by differences in access to knowledge and information in the developing world is a whole set of complementary digital and nondigital infrastructures that enable storing, processing, and communicating information and knowledge in new ways. Broadly speaking, the complementary set of infrastructures otherwise known as the infostructure include an underlying electrical and telephonic grid, national core computing and capacity (for example, personal computers and Internet hosts), and access to online subscriptions and digital libraries (DLs).

DLs software provides a convenient way of organizing information and making it available over the Internet (Witten et al., 2000). A *collection* of information comprises several (typically several thousand, or several million) documents. A *document*, in turn, is any information-bearing message in electronically recorded form. Documents are the fundamental unit from which information collections are built, although they may have their own substructure and associated files. Documents generally comprise text, though they may be images, sound files, or video. A collection may contain many different types of documents. Each collection provides a uniform interface through which all documents in it can be accessed—although the way that documents are displayed will depend on their medium and format. A *library* generally includes many different collections, each organized differently—though there is a strong family resemblance in how collections are presented.

Making information available using this system is far more than just "putting it on the Web." The DLs software allows the collection to become maintainable, searchable, and browsable. Prior to presentation, each collection undergoes a "building" process that, once established, is completely automatic. This process creates all the structures that are used at run-time for accessing the collection. Searching is based on various indexes involving full text and metadata. Browsing is based on various metadata and on phrase structures, and other information, abstracted from the full text of the documents. Support structures for both are created during the building operation. When new material appears, it can be fully incorporated into the collection by rebuilding.

Over the past several years, Tulane University's Payson Center has collaborated in the creation and distribution of several CD-ROM DLs using Greenstone software in conjunction with the Human Info NGO. This

humanitarian project is implemented in cooperation with numerous organizations and agencies and includes publications of the United Nations University, UN ACC/SCN, IFPRI, the World Food Programme, GTZ-GATE, FAO, NAS-BOSTID, Peace Corps, and many others.

Distribution and creation of DLs has also been supported by research. The research team of the project includes Dr. Ian H. Witten, who initiated and directs the New Zealand Digital Library Project at Waikato University in New Zealand. A large-scale research project that has been in existence for 5 years, the NZDL aims to develop novel technologies for digital libraries and to promote their use internationally. The New Zealand team has worked with several UN agencies, including the Food and Agriculture Organization in Rome, UNESCO in Paris, and the United Nations University in Tokyo, as well as other organizations as diverse as CISTI, which is the technological branch of the Canadian National Library, and the BBC in London. The Greenstone software is a comprehensive DL system that is already in use in developing countries for disseminating prebuilt information collections (Witten et al., 2001a) in many institutes and universities throughout the world, from Beijing to Cape Town, from the Mari El Republic in Russia to London.

Greenstone comes as an ICT tool that touches on the heart of the tension produced by publishers and distributors of books. As Witten (2003) states:

What future has the book in the digital world? The question is a complex one that is being widely aired (see Lynch, 2001, for a particularly thoughtful and comprehensive discussion). Authors and publishers ask how many copies of a work will be sold if networked digital libraries enable worldwide access to an electronic copy of it. Their nightmare is that the answer is one: how many books will be published online if the entire market can be extinguished by the sale of one electronic copy to a public library? (Samuelson & Davis, 2000)

To address the exceptionally broad requirements of DLs, the Greenstone system is public and extensible. It is issued under the Gnu General Public License, and, in the spirit of open-source software, users are invited to contribute modifications and enhancements. Only through an international cooperative effort will DL software become sufficiently comprehensive to meet the world's needs. Currently, the Greenstone software has been used by several UN agencies, including the Food and Agriculture Organization in Rome, UNESCO in Paris, the United Nations University in Tokyo, and the Centre for Human Settlements (Habitat) in Nairobi. It is used at sites throughout the world, and interfaces and collections exist in languages ranging from Portuguese to Chinese, from Maori

to Arabic. Collections range from newspaper articles to technical documents, from educational journals to oral history, from visual art to folksongs.[1]

For example, the Community Development Library (CDL) 2.1 contains 1,785 publications (160,000 pages) in various areas of community development. The final objective of this cooperative project is to provide those involved in the areas of development and basic needs with access to a free or low-cost CD-ROM library of aproximately 3,000 books containing most multidisciplinary insights and solutions they need for international development.

FUTURE TRENDS: USING NEW TECHNOLOGIES TO ADDRESS OLD PROBLEMS—ICON-BASED DL FOR TRAINING IN DISASTER MANAGEMENT

Despite at least 55 years of acknowledgement that universal literacy is the heart of development, and despite repeated rhetorical commitments to universal enrollment, even the modest goal of universal primary school completion has not been realized. If current trends hold, one out of every six adults will remain illiterate eight years from now. (World Development Report, 2004)

The most vulnerable populations are almost always also engaged in responding to and mitigating disasters (and terrorist acts) in less-developed countries. These populations are usually illiterate or semiliterate and have not received appropriate training in disaster management or in the use of ICT such as digital libraries. The U.S. central-city and rural migrant labor environments also have significant numbers of semiliterate individuals. This is enhanced by the fact that a large portion of the population is functionally illiterate. These are the individuals that are in most dire need of the information contained in these libraries, in most need of training for disaster management, and in most need of training in how to use and produce ICT.

An icon-based DL prototype would allow new ways of searching, organizing, and preserving nontextual information related to disaster preparedness. An *icon-based (iconic) digital library* would not only be fully searchable by an illiterate user without the use of text, but could also be used to train communities in disaster preparedness.

A successful implementation of a prototype has been the implementation of a First Aid in Pictures (FAP)

icon-based digital library. The FAP has been successfully utilized by the Red Cross in the California earthquakes of the 1990s, and in Afghanistan and El Salvador (DeLong et al., 1987). The successful use of this training booklet suggests that the prototype has the potential for applicability in the real-world applications.

Developed under Linux, the Greenstone server runs on any Windows, Unix, or MacOS/X system. All versions of Windows are supported, from 3.1 up (including 3.1/3.11, 95/98/ME/, NT/2000 and XP). Supporting primitive platforms poses substantial challenges of a rather mundane nature: for example, Microsoft compilers no longer support Windows 3.1, and it is necessary to acquire obsolete versions (e.g., at software auctions). Under Windows, prebuilt collections can be viewed on any system with at least 8 Mb RAM, but collections cannot be built under Windows 3.1/3.11—for this at least a Pentium processor is generally required, except for very small collections.

CONCLUSION

North–South disseminating of information originating in the developed world (usually the North) to developing countries (usually in the South) is a useful activity for developing countries. But a more effective strategy for sustainable human development is to disseminate the *capacity* of creating information collections, rather than the collections themselves. This will allow developing countries to participate actively in our information society, rather than observing it from outside. It will stimulate the creation of new industry, and can truly be called "technology transfer." But above all, it will help ensure that intellectual property remains where it belongs, in the hands of those who produce it.

DLs software gives ICT experts and development practitioners a unique opportunity to bridge the various divides: literacy, digital, and social. But this will only be possible if the illiterate and semiliterate populations and communities are recognized as the users in most need of ICT for development.

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KEY TERMS

Collection of Information: This comprises several (typically several thousand, or several million) documents.

Digital Library: A digital library is an organized collection of information, a focused collection of digital objects, including text, video, and audio, along with methods for access and retrieval, and for selection, organization, and maintenance of the collection (Witten & Bainbridge, 2002).

Document: Any information-bearing message in electronically recorded form. Documents are the fundamental unit from which information collections are built, although they may have their own substructure and associated files.

Functionally Illiterate Populations: People who cannot read a map or a menu.

Global Digital Divide: The gap established due to unequal capacity among countries to access, adapt, and create knowledge via the use of digital information and communication technologies.

Infostructure: The complementary set of infrastructures, including an underlying electrical and telephonic grid, national core computing, and capacity access to online subscriptions and digital libraries (DLs).

Library: A library generally includes many different collections, each organized differently—though there is a strong family resemblance in how collections are presented.

Social Digital Divide: The social stratification created by the digital divide within a country.

ENDNOTE

[1] Further details, and many examples, can be obtained over the Internet from nzdl.org.

Digital Library Structure and Software

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INTRODUCTION

Digital libraries (DL) can be characterized as the "high end" of the Internet, digital systems which offer significant quantities of organized, selected materials of the type traditionally found in libraries, such as books, journal articles, photographs and similar documents (Schwartz, 2000). They normally offer quality resources based on the collections of well-known institutions, such as major libraries, archives, historical and cultural associations (Love & Feather, 1998). The field of digital libraries is now firmly established as an area of study, with textbooks (Arms, 2000; Chowdhury & Chowdhury, 2003; Lesk, 1997); electronic journals from the US (D-Lib Magazine: http://www.dlib.org/) and the UK (Ariadne: http://www.ariadne.ac.uk/); even encyclopedia articles (McCarthy, 2004).

BACKGROUND

Digital libraries require appropriate presentation and careful logical organization to make them easily accessible, but arrangements typical of Web systems are inadequate for them. The classic Web structure, where random links can be created between any pair of pages, is not appropriate to highly organized data. The other classic arrangement is the tree or directory structure often found in computerized systems, where the user starts from a "trunk" or "root directory" and goes to a branch, then a subdivision of that branch. This is effective for individual images, but is inadequate for navigating sequential pages, as in a digital library system presenting lengthy texts. Before discussing the different software solutions available, it is useful to review the principle types of digital material currently offered by digital libraries.

DIGITAL LIBRARY MATERIALS

At this time digital library resources can be divided into three categories: images, texts and other resources:

Images

Image access is used for individual visual resources, such as photographs, posters, drawings, etc. The classic procedure uses a series of three types of image. Scanning produces a high-quality archive image, which is then used to generate an access image, for general public use. Finally, a small thumbnail image is produced, for quick reference (Boss, 2001; Lee, 2001). In more detail:

Archive Image

A high-quality image, scanned directly from the original, destined for long-term preservation. Normally an uncompressed TIF (Tagged Image File Format) image is used here; TIFs offer the highest quality images and a resolution of 600 dpi (dots per inch) is standard. As scanning is an expensive operation, which exposes original materials to possible damage, the archive image will be carefully preserved. It must always exist at the system level, but is not necessarily available to the end-user. TIF files occupy significant server space and imply lengthy download times. Another factor is that some DL will want to sell their own hard-copy prints of quality images.

Access Image or Working Image

A quality image, adequate for consultation and serious study by digital library users. This is normally a high-quality JPG (Joint Photographic Experts Group) image, generated from the archival TIF. JPG files are widely used on the Internet and offer quality spatial and color reproduction and a high compression ratio. For DL purposes JPG images will often be generated at a resolution of 300 dpi; a size of 640x480 pixels is also common.

Thumbnail Image

A small reference image, which gives the user a general idea of the Access image, before downloading that image. Typically a medium to low quality JPG, generated

from the Access image, but about one-tenth of its size, and commonly produced at a resolution of 72 dpi. GIF format (Graphic Interchange Format) can also be used for thumbnails (Arizona, 2000; Western, 2003).

Text

Multi-page text documents, such as books, or journal articles require special procedures. Numerous options are possible and the principle alternatives for input, simple text presentations and pagination will be examined in turn; the earliest procedures will be discussed first.

Text Input

Manual keyboarding was originally adopted by Project Gutenberg, the first significant text-oriented digital library (http://promo.net/pg/), founded in 1971. This is a laborious process which severely limits productivity, and is now rarely used.

OCR (Optical Character Recognition) software is now routinely used to scan text into digital libraries. OmniPage Pro (http://www.scansoft.com/omnipage/) or the Russian software ABBYY (http://www.abbyy.com/) are frequently cited in the digital library context. OCR text requires careful revision, because even 99.99% accuracy means that there will be one mistake every couple of pages, but only a person fully conversant with the literature will be able to identify errors at this level. Many digital library texts are older books whose ornate type faces or soiled pages can generate additional OCR errors.

Simple Text Presentations

"Plain-vanilla" ASCII texts were the original basis of Project Gutenberg (http://promo.net/pg/). These TXT files can be used by a variety of computing platforms, but are suited to a word processing, rather than an Internet environment.

HTML text is now firmly established for textual work in digital libraries, including Project Gutenberg. All Internet users are familiar with HTML, files need not be much larger than TXT files, it is easy to present crisp black text on white background, text size can be quickly adjusted on computer screens, HTML can be indexed, readers can easily take extracts from the text, and, within the constraints of ethics and plagiarism, manipulate them and insert them in other documents.

The entire text, without page divisions, is normally delivered by Project Gutenberg as an ASCII or HTML file. Entire chapters or lengthy blocks of text are supplied

by other digital libraries, such as Bartleby.com (http://www.bartleby.com/), another pioneering system, which has been offering free copies of classic books since 1963.

Disadvantages of HTML are that it does not necessarily communicate the original text in an integral manner: the "look and feel" may be different, transcription errors may occur and it may not accurately reproduce a combination of text and images.

Paginated Text

Pagination is typical of the traditional book, and most sophisticated digital library software now creates easily-navigated page-by-page sequences. The reader wants above all to go to the next page, also to go back a page when necessary, using appropriate icons or buttons.

JPG images reproduce individual pages exactly, without scanning or transcription errors, making them suitable for research. JPGs are widely used on the Internet and are easy to generate, download, and print; they are also appropriate for mixed text and images. But small size text, older typefaces and brown, mottled or foxed paper may reduce legibility, while readers cannot easily take extracts from a JPG document.

Adobe Acrobat's PDF (Portable Document File) format offers advantages similar to JPGs, such as quality reproduction of the original in relatively small files, excellent enlargement of the text and easy combination of text with images. Content producers can adjust the security settings within Acrobat to constrain the end user's interaction with the document. The digital library needs to purchase Adobe Acrobat (http://www.adobe.com/products/acrobat/main.html) to create PDFs, but end-users can easily download the free Adobe Reader.

Digital libraries offering access to texts therefore have two principle possibilities, text, typically delivered in HTML, or page images, which typically use JPGs. In fact, these are not alternatives, they are complementary approaches. The image offers a reliable reproduction of the text, while HTML may be easier for the end-user. Intellectual property and copyright issues may also impact the decision to present either HTML text or images. Even if only images are made available to the end-user, it will be necessary to create a text version in order to generate an index. Word-by-word indexing is a major advantage offered by digital libraries, which cannot be matched by traditional libraries.

For examples of sophisticated paginated access, browse the 8,500-volume Making of America collection from the University of Michigan at http://www.hti.umich.edu/cgi/t/text/text-idx?tpl=browse.tpl&c=moa&cc=moa. This uses DLXS software, discussed in more detail below. The Digital

Quaker Collection (http://esr.earlham.edu/dqc/) contains full text and page images of over 500 Quaker works from the 17th and 18th centuries, generated using eXist software (see below for details).

The three-level imaging sequence, Archive, Access, and Thumbnail, described in Image access above, is of lesser relevance to text systems. It is still possible to use TIF format to produce the Archive copy, because this creates a high quality preservation file in a non-commercial format. But the TIF will rarely be available to the reader in a text-based system. TIF files are slow to download and text, even with images, can be reproduced adequately using JPGs or PDFs. Thumbnail images of a series of book pages will normally appear identical to the reader, thus adding little to the digital library, and are therefore often omitted.

Location within physical books is not a problem; it is easy to see when half the text has been read, or to flip back to the table of contents. In digital books readers need a clear indication of location in relation to the text as a whole, via page numbering or by a link to a table of contents or chapter list. If the text has notes or references, it will be necessary to link to them, then jump back to the main text. It will also be necessary to link to a full bibliographic citation.

Other Resources

Collections of maps and aerial photographs need to offer spatially-oriented access, so that users can pan or zoom. For an example, see the collection of 50,000 old aerial photographs of the State of Georgia, USA, at http://dbs.galib.uga.edu/gaph/html/. Collections of 3-dimensional objects may need to be viewed from various angles. See http://www.lunaimaging.com/insight/featuretour/multiview.html for an example using Luna Imaging software (discussed in more detail below). Sound and moving images are still relatively rare in digital libraries, for examples see History and Politics Out Loud: a searchable archive of politically significant audio materials from NorthWestern University, USA (http://www.hpol.org/) or the Internet Archive at http://www.archive.org/movies/index.html.

Metadata

Digital resources need to be adequately described. Historical photographs, for example, are only useful if location, date, subject, etc., have been identified and input to the system. This additional information is known as metadata and must be added by trained professionals. There are various types of metadata:

- **Descriptive metadata:** creator, title, subject, etc.
- **Structural metadata:** information on the internal organization of the digital resource, such as the chapters in a book.
- **Administrative metadata:** management information, including technical information, such as scanning resolution, hardware and software used, also rights management information and restrictions on use.

Access

Initial access to a digital library is through a gateway, which needs to be attractive and easy to use. Many digital libraries, especially those sponsored by educational institutions, offer free and immediate access to their materials. Commercial digital libraries, such as e-journal and paid e-book collections, embed security procedures, such as IP recognition or password control, into their gateways. Once in the digital library, the user is normally offered a choice between browse and search access.

- **Browse access** or directory-based systems take the user to a menu of choices, such as an alphabetically organized list of authors or titles, a categorized list by subject, geographic location, specific collection, etc. Menus can be nested, subdividing broad subjects. This is the easiest access to organize (it can even be created manually), and is offered by almost all digital libraries, normally from the opening page.
- **Search access** involves software, which is used to create an index. The user queries the index via a search box, usually a prominent feature of the digital library.

See, for example, The American Memory collections of the Library of Congress, which offer both browse access (via a "Collection Finder") and search access prominently from the opening page (http://www.memory.loc.gov).

Boolean search (AND, OR, NOT) is common in digital libraries. For a sophisticated search of the documents of the Chicago Women's Liberation Union, see http://cwluherstory.master.com/texis/master/search/?q=CWLU&s=SS&cmd=Options. This uses indexing software from Master.com (http://www.master.com/texis/master/app/home.html). A help file will often be available, to familiarize the user with search techniques, which can vary considerably between systems. The State Library of New South Wales offers a good

example at http://www.sl.nsw.gov.au/search/guide.cfm. The user will also want to know exactly what is being searched: is it the full text of the document? Or the text of the document, but excluding common words? Or the search may be limited to metadata elements, such as author, title and abstract. This is not always clearly stated. Whatever the parameters, the use of a computer-produced index implies a higher level of automated support than the browse or directory systems cited previously. Search access is therefore not quite as common as directory access.

Efficient retrieval implies both types of access. These are also the principal options for retrieving information from the WWW: browse access is available from directory-based systems such as that which forms the basis of Yahoo! and the Open Directory, while search is offered by search engines, such as Google.

DIGITAL LIBRARY SOFTWARE

It is possible to create small-scale digital collections by hand, using standard HTML editing or open-source software. But, due to the complexity and variety of the field, purpose-designed software is now in common use. In alphabetical order, principle options are:

CONTENTdm Digital Media Management Software Suite

A high-performance storage and retrieval software for multimedia collections which is rapidly gaining acceptance (http://contentdm.com/index.html). Developed at the University of Washington, it is offered to libraries, museums, and non-profit archives by OCLC, the major supplier of bibliographic data to libraries (http://www.oclc.org/contentdm/default.htm). Collections relevant to regional studies include the Louisiana Digital Library (http://www.lsu.edu/diglib) and Early Las Vegas from the University of Nevada, Las Vegas (http://www.library.unlv.edu/early_las_vegas/index.html).

DLXS

Offered by the University of Michigan Digital Library eXtension Service. It is a comprehensive suite of software tools, especially suited to indexing and presenting multi-page documents (http://www.dlxs.org/). It has already been mentioned as the basis for Michigan's The Making of America collection with approximately 8,500 books and 50,000 journal articles from the antebellum period through reconstruction (http://www.hti.um ich.edu/

cgi/t/text/text-idx?tpl=browse. tpl&c=moa&cc=moa). A further 3,000 books are in the Wright American Fiction collection 1851-1875 (http://www.letrs.indiana.edu/web/w/wright2/).

DSpace

A "Durable Digital Depository," designed to capture, distribute and preserve the intellectual output of universities and similar institutions (http://dspace.org/). A joint project of MIT Libraries and the Hewlett-Packard Company, the original DSpace can be searched at https://dspace.mit.edu/index.jsp; full-text is in PDF. An open-source software, DSpace can be freely downloaded from http://sourceforge.net/projects/dspace/ (Atwood, 2002; Carnevale, 2003).

eXist

An open source XML database created in Germany (http://exist.sourceforge.net or http://exist-db.org/). It was used for one of most ambitious digitization projects of recent years, The Proceedings of the Old Bailey, 1674 to 1834 (http://www.oldbaileyonline.org/). This offers access to the largest body of texts detailing the lives of non-elite people ever published, accounts of over 100,000 criminal trials held at London's central criminal court.

Greenstone Digital Library Software

An open source software suite, developed in New Zealand at the University of Waikato (http://www.greenstone.org/). It automatically creates organized collections of digitized documents with a standardized interface, with automatic full-text indexing, listing of titles, etc. (Witten & Bainbridge, 2002). It handles large collections of documents, in a variety of formats, works on a server or desktop, and exports to CD-ROM. It is used for the New Zealand Digital Library (http://www.nzdl.org/), notable for humanitarian and UN collections in a variety of languages and scripts, including Chinese and Arabic. It is distributed free under GNU Public License, and can be downloaded from http://www.greenstone.org/english/download.html. All texts in Project Gutenberg can be searched via Greenstone at http://public.ibiblio.org/gsdl/cgi-bin/library.cgi?a=p&p=about&c=gberg.

Hyperion Digital Media Archive

A tool for organizing, full-text indexing, storing and accessing of non-book holdings in a digital format

(http://www.sirsi.com/Sirsiproducts/hyperion.html). It was produced by Sirsi, a Huntsville, Alabama, company which supplies automated cataloging and circulation systems to libraries of all types. An important application is the Civil Rights in Mississippi Digital Archive of resources on race relations, created by the University of Southern Mississippi (http://www.lib.usm.edu/~spcol/crda/).

Insight Image Management and Delivery System

Produced by Luna Imaging, a joint enterprise of the J. Paul Getty Trust, California, and Eastman Kodak (http://www.luna-imaging.com/). This high quality imaging software, notable for its powerful zoom capability, is used for works of art, photographs and maps. An example is the David Rumsey Historical Map Collection (http://www.davidrumsey.com/), which features over 8,000 maps and won a Webby Award in 2002.

Olive ActivePaper Archive Software

Permits historical newspapers to be scanned from the originals, or from microfilm, creating fully searchable digital collections. Readers are able to click on any article, photograph or advertisement, which is then enlarged and presented in a separate window. For a sample, see the Missouri Historical Newspapers Collection (http://newspapers.umsystem.edu/archive/Skins/Missouri/navigator.asp). OCLC, the major supplier of bibliographic data to libraries, offers Olive to libraries (http://www.oclc.org/middleeast/en/olive/about/); Olive Software is a Denver company (http://www.olivesoftware.com/home.html).

FUTURE TRENDS

The following future developments can be forecast with confidence:

- **More standardization:** the current period is one of experimentation, but standardized solutions will rapidly become established. Cross-system searching and access will be major considerations in the future.
- **More access to audio, film and video:** resources are still thin in this area, but more sophisticated software and increased bandwidth will make much more material available.

CONCLUSION

Digital libraries will have a bright future in a world which is ever more reliant on electronic access to information to guarantee social integration, progress and the end of the digital divide. The increasing availability of special purpose software will facilitate digital library production. Open source software such as Greenstone, which is available free of charge, will be of great value for regional community digitization projects.

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KEY TERMS

ASCII: American Standard Code for Information Interchange-Codification system used to convert simple text to computer readable form.

Digital Library: Provides the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Waters, 1998).

JPEG: Joint Photographic Experts Group-Specification for reproduction of digital images, widely used on the Internet.

Metadata: Data about data, surrogates or descriptions of data, key words or codes used as systematic keys to the content of digital objects, such as Web pages or digital images.

OCR: Optical Character Recognition-Software that recognizes text and converts it to a form in which it can be processed by computer.

PDF: Portable Document Format-Method of document reproduction, generated by Adobe Acrobat Systems, notable for quality reproduction of both text and accompanying images.

TIFF: Tagged Image File Format-High quality image reproduction format, typically generates large files used for archival purposes.

Distance Education in the Era of Internet

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DISTANCE EDUCATION: A BRIEF HISTORY

Let us start with a definition: distance education can be called an educational learning process or system where teachers or instructors are separated in space from students.

More specifically, using a definition developed by Desmond Keegan (1986), we can summarize the fundamental characteristics of distance education, as follows:

- The quasi-permanent separation of teacher and learner throughout the duration of the learning process.
- The influence of an educational organization both in planning and preparation of learning materials and in the provision of student support services.
- The use of technical media to connect teachers with students and transmit the content of the course;
- The provision of two-way communication so that the student may benefit from or even initiate a dialogue.
- The quasi-permanent absence of the learning group throughout the duration of the learning process so that people are usually taught as individuals and not in groups, with the possibility of occasional meetings for both didactic and socialization purposes.

Research studies and practical experiences have demonstrated how education is considered "Essential for civic order and citizenship and for sustainable economic growth and the reduction of poverty" (World Bank, 1995), especially in developing societies. If we take then this fact into account, it is clear that many countries have started to employ distance education also as a mean to address serious and multiple challenges facing sustainable human development, especially in those countries where access to traditional education is limited by the infrastructure, resources, economy or geography. One of the major objectives of distance education is, in fact, to help widen the access to education in general and to raise the quality of education by training more educators and teachers and making more resources available to the largest groups of people.

From the first correspondence studies in shorthand initiated in England by Pitman in 1840's and the establishment of the first University Correspondence Teaching at the University of Chicago in 1890's to the present day where we have seen an explosion of online education on the Internet, we have crossed many gates of "Evolution." The use of modern ICT has dramatically change the way distance education is developed and delivered and opens the way to interesting developments. Literature normally divides the history of the development of distance education into "Generations," with the massive use of ICT we can say we have reached the Third Generation of distance education. In Table 1 we can see how these "Generations" are affected by the use of communication technology:

ICT AND MODERN DISTANCE EDUCATION

We would now like to focus more on the revolutions in distance education that have been triggered by the use of modern ICT.

Let us start with a more recent definition of distance dducation developed by the U.S. Department of Education (1989): "Distance education is the application of telecommunications and electronic devices which enable students and learners to receive instruction which originates from some distant location."

In this definition we can already notice the use of two keywords that define our third generation distance education: Use of telecommunications (today's Internet-enabled networks) and electronic devices (the Personal Computers).

Impact of Communication via the Internet on Distance Education

Since its introduction to the public, the Internet has always been seen as a revolutionary way to share digital content and also to enable easy synchronous and asynchronous communication among peers or communities of people (e-mails, chat, forums, threaded discussions, etc.).

The increasing availability of communication bandwidth (DSL, Powerline, Wireless communication, etc.) have opened a variety of possibilities, including the online transmission and reception of rich multimedia content, use of Voice over Internet Protocol (VoIP) and Desktop Videoconferencing. The trend clearly shows a

Table 1. Evolution of the generations of distance education in relationship with the developments of communication technology

Generation Level	Time	Communication Technology	Description
First Generation	1840 – 1920	Communication in Presence, Mail	Correspondence Teaching, using textbooks and occasionally written communication between student and Tutor
Second Generation	1920 - 1980	Communication in Presence, Mail, Telephone, Radio and Television	The base is still Correspondence Teaching but the use of the telephony allows more frequent and direct remote contact between student and Tutor. Contact with the student population provided by radio and television broadcasts grows substantially. The content of the course, thanks also to the use of audio and video tapes, is delivered in more engaging and interactive ways
Third Generation	1980 -	Communication in Presence, Mail, Telephone, Radio and Television, the INTERNET	The real "Quantum leap" from the second generation is the use of PC and connection to the Internet. The development of engaging and multimedia-rich CD-ROMs gradually substitutes traditional textbooks and videotapes. Access to an almost unlimited repository of content is provided through the World Wide Web and the use of e-mails and synchronous (real-time) chatting enable an easy, fast and reliable communication with Tutors and also among Students (Online Communities).

readiness to utilize real-time collaboration and communication between peers or groups. This naturally enhances the possibility of communicating anywhere and anytime with anybody (globalization, the connected village, etc.).

The impact on distance education is really significant as distance students can now have access to enormous amount of content and information. They can work in groups whilst still being physically separated and perform a lot of rich interactive activities that before were only possible through classroom training.

The Evolution of Personal Computers

An advanced laptop computer today has a computing power and memory capability 1,000 times greater than to the first PCs, which appeared on our desks in the mid-'80's.

This evolution in technology, i.e., the possibility of reducing the size and increasing the power of computing devices, has also had a cultural impact. We are used to working and using devices which have an embedded intelligence and computing capability that offers the possibility to connect and be connected to content, information and data. This "Cultural Revolution" is silently embracing all level of human activities, from the way we manage our homes to the way we drive a car.

The quantity of digital information that we process or transfer during a working day, without being aware of doing so, is unbelievably high.

In this new cultural context we are starting to use our PCs as integrated computing, communication and multimedia devices. These machines are the natural terminal for distance education related activities ranging from the delivery or access to content, to communication with fellow students and Tutors.

The Brainware: Software Applications to Support Educational Processes

The use of communication bandwidth and the computing power of modern PCs is not sufficient to exploit the possibilities opened by modern ICT. In parallel with the evolution of PCs we have seen a vigorous development of the PC "Brainware," the software which has allowed the management of multimedia content development, the integration of real-time communication into collaborative environments and the support of the complex educational processes.

A series of applications have been created to help educational institutions to develop, organize and deliver learning content, to track student activities and performances and to evaluate learning outcomes. These soft-

ware applications are commonly called Learning Management Systems (LMS) and are able to support all the administrative and logistic processes of training in addition to the communication and evaluation activities mentioned before.

Other software applications have developed very sophisticated environments which enable content developers and teachers to transform and integrate content of different types (text, audio, video, animations, simulations, etc.) in very interactive and appealing CBT (Computer-Based Training) or WBT (Web-Based Training). These contents can be then distributed online, via the Internet, and off-line by CD-ROMs.

Finally a more recent series of software applications have been produced under the category of "Web Collaboration" which are able to partially reproduce collaboration activities occurring between people or groups, such as classroom, meeting or seminar interactions. These applications are able to bring together real-time audio, video, application sharing and Web-based content.

Let us now list the main benefits derived by coupling ICT with distance education.

Students

- Students can reach a great quantity of information and additional references/study materials made available through Internet connectivity including materials developed by teachers and/or shared in the virtual space of the class.
- Students have the possibility to access interactive and engaging WBTs that can increase their motivation to carry on their studies.

Teachers/Tutors

- Teachers can organize online events by using Virtual Classes and Web Collaboration applications. By means of these synchronous events students can connect from distant sites and have a "social" experience in the class without the need to travel to centralized locations.
- Tutors can analyze faster the behavior of the online students and provide adequate stimulation when the activity and/or response from them is lacking. The capability to reach single students and personalize the support is also a way to motivate better and increase completion rates of the studies.

Schools

- By using specialized application software supporting distance education activities and their tracking, schools can better organize the material and the support given to both teachers and students by including: Virtual Libraries, Discussion Forums, Bulletin Boards, Virtual Classrooms, Interactive WBTs, Chat and other online communication tools.

DISTANCE EDUCATION AND THE "HUMAN FACTOR:" THE COLLABORATIVE WAY FOR DISTANCE EDUCATION

As early as the 1940s (Dale, 1946) there were investigations about how people learn and how efficient could be

Figure 1. How retention rate is affected by learning style
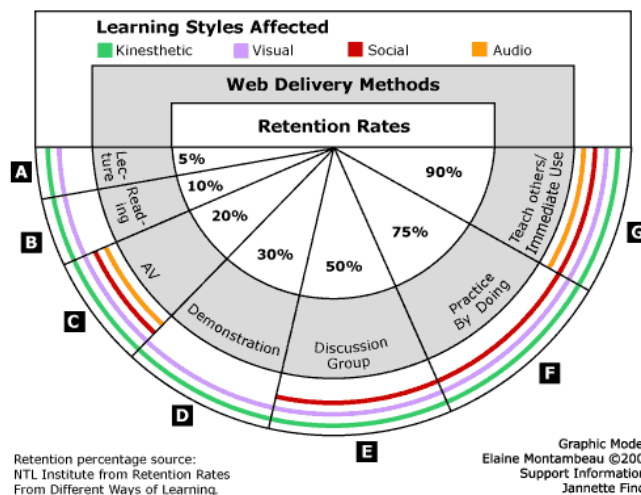
different learning methods for the retention of knowledge transferred during a training event. Recent reports (Monambeau & Finch, 2000) try also to associate retention rates to learning styles as we can see in Figure 1.

From this figure we can notice that people retain better (50% or higher) what they learn whenever a social or collaborative learning style is applied. We can therefore agree that Collaborative Learning appears to be crucial to the effectiveness of any learning environment (Hiltz, 1997). Other studies (Benbunan-Fich, 1997) assess that working in groups, instead of working alone, significantly increases motivation, perception of skill development and solution satisfaction. A similar result is found when assessing learning effectiveness (knowledge retention) two weeks after the training has concluded. How does that apply to distance education?

One of the biggest obstacles in distance education has always been the risk of social isolation of the students participating to the programs. If the students are not being adequately stimulated and motivated they might easily lose their way and delay study completion. It is clear that not all people learn the same way. I might learn quicker by reading a text or by watching a simulation whilst other people might respond better to listening to a lecture. Anyway (despite the personal differences) everyone experiences a substantial amount of knowledge transfer through social contact, such as sharing experiences with other people and learning by copying. The question is how can we keep a Collaborative Learning process alive when we deal with distance education?

Distance dducation requires also a great deal of self-discipline and most of the people prefer to be accompanied by someone through an educational experience (shared responsibility) than to have to accomplish their educational objective alone.

If we want to realize an effective distance education project we should therefore think about how can we reproduce, in a remotely managed environment, the same typologies of social interactions and guidance that regu-

lar students benefit from in colleges or schools. Modern distance education projects try to exploit the pervasive power of the Internet connection and the effectiveness of Web Collaboration tools in order to provide the "Virtual Spaces" where students can meet and exchange information, where content can be shared and discussed or where questions can be answered. Unlike previous generation of distance education, the "Virtual Spaces" created can be accessed by the whole community and not only by the single student. The content and information exchanged there can be stored, categorized and reused in another session of distance education. Modern Web Collaboration tools can greatly enhance the process of sharing and spreading the knowledge acquired within communities, where here a community can indicate a group of people sharing the same interests or a group of students following a same course.

The most common tools provided for Web Collaboration activities are summarized in Table 2.

We can say in conclusion that Web Collaboration technology offers the possibility of managing and nurturing "Virtual Communities" that are able to replicate most of the activities students perform in a campus, such as meeting and discussing, going to the library and browsing books, meeting in the cafeteria and arguing about a subject. Modern distance education is therefore able to make use (at least partially) of the collaborative learning experience that is so important in the frame of the learning process. In this way the effectiveness and the motivation of distance learners can be greatly increased and educational results achieved faster.

THE ONLINE TUTORS: A STRATEGIC PILLAR OF MODERN DISTANCE EDUCATION

In First and Second generation distance education, most of the interactivity occurred between the single student

Table 2. List of commonly used Web collaboration tools

Type of tool	Description
e-mail	Allows the member of the Community to start a Peer-to-Peer (P2P) communication in an asynchronous way.
Text chat	Allows the members of the Community to start a Peer to Peer communication in a synchronous way, interacting in real time.
Forum/Threaded discussions	It is a form of asynchronous discussion where themes are posted in a common space. The members of the Community can post comments or questions, related to them.
Content Repository	Could be seen as an online bookshop, where the members of the Community find documents related to the work they are doing or find links to other content repositories. This feature is also used to build the knowledge repository of the Community, together with the content of the Forum/Threaded Discussions.

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and the distance Tutor. We have seen in the previous paragraph that modern distance education can utilize ICT to reproduce the social contact among all the players of the educational process (Students, Teachers, Tutors). This new technological environment requires Supervisors or Tutors to perform new activities that are strategically important to the accomplishment of the student's objectives. There is a need for a new type of Tutor, called "Online Tutor," who can represent a focal point not only for the single student but also for the community gathered around the course. The Online Tutor has the task of monitoring the participation of the students in the discussions, facilitating the answering of questions and making sure that everybody feels comfortable with the use of the technical tools adopted (sometimes the use of ICT can represent a barrier instead of a facilitation).

Modern distance education has therefore created a new role that acts in parallel with Personal Tutors and Teachers/Instructors (although some times people play multiple roles). This role involve facilitating and stimulating the social behavior across the network and making sure the community of students is just that. Without the work of the Online Tutor, the students can lose motivation and feel left apart by the others, therefore their course of study becomes less effective and takes longer to accomplish. The Online Tutor (despite the name related to the use of technology) is the person who tries to match the need to work in a Distance Environment with the need to have social contact. He is the person who tries to solve the problems related to the human factor that we have mentioned in a previous paragraph.

The use of modern online education has also required a transformation of Tutors and Teachers. The way to communicate, the way to prepare and deliver content across the Web is different from the traditional one. There is nowadays a need to train distance educators so that they can effectively use the powerful tools and technologies available.

CONCLUSION

Distance education has always been an opportunity to spread knowledge to places where economical, geographical and organizational problems are an obstacle to the cultural growth of the community. On the top of which we have, nowadays, the need for continuous education, keeping people updated and skilled, since the evolution of technology and of our globalized world is fast and ongoing.

Modern distance education (based on the use of Internet communication and the evolution of PCs into an integrated Multimedia and communication system) is stimulating the effectiveness and the quality of distance

education by allowing the reproduction of social behaviors even remotely. The new concept of the Online Community, a group of people interested in specific fields or following a similar study path, enables the use of Collaborative Learning also within the framework of distance education that, until now, has only been possible by attending traditional educational settings (College and Schools). Access to the Internet is also becoming widespread in remote villages and communities, enabling fast communication among Online Communities.

The exchange of information and content is no longer subject to barriers of time and space. In other words, access to education in general and the quality of distance education has been greatly enhanced by the use of ICT. The third generation of distance education has also developed new roles, such as the one of Online Tutor. This role is fundamental for the accomplishment of educational goals and for the stimulation of the social contact among the members of the Online Community. The supervision of student behavior by the Online Tutor is a strategic activity that helps to overcome problems of isolation and abandonment which are typically felt by distance students.

The use of ICT in distance education is not, however, a seamless passage from the traditional way to educate to the world of ICT supported distance education. Personal Tutors and Teachers have to be trained and educated in order to be able to take advantage of the powerful features made available by the technology and Internet communication. The evolution of modern distance education is even more connected with Knowledge Management. Learning Management Systems used to organize and deliver distance education have also become a means to collect, categorize and deliver knowledge developed by the Online Community during the course of study.

The possibility of accessing and re-using the knowledge developed during the course of a distance education program is an incredible advantage and difference with respect to older generation of distance education. New learners will be facilitated simply by accessing the content and information discussed by their predecessors and their own discussions will be part of the heritage for the new learners.

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KEY TERMS

Collaborative Learning: Collaborative Learning is, broadly speaking, an approach that involves learners (and sometimes teachers) working together and learning from each other.

Distance Education: Distance education is an educational learning process or system where teachers or instructors are separated in space from students.

Virtual Classroom: Virtual Classroom is a Web-based environment that allows students to participate in live training events without the need to be physically in the same place. In a Virtual Classroom one listens to lectures, participates in Lab exercises, asks questions to teachers or students and receives feedback just as you would do in a conventional classroom.

Virtual Community: Virtual Community is a community of people with shared interests, communicating over the Internet or via other means where they are not in physical contact with each other. Virtual communities exist on e-mail mailing lists, Internet Relay Chat, and Web-page communities. A virtual community is characterized by the personal relationships that may develop between its members.

Virtual Space: Any space, physical or virtual, is an environment where many different interactions, usually focused on one or small set of goals, occur. A virtual space is an application that is reachable via a communication network and is organized in a way that allows different people to connect and perform defined set of activities such as discussions, structured information storage and retrieval or real time communication.

Web Collaboration: Web Collaboration is a particular use of a Virtual Space where people can connect together in a certain number and perform synchronous activities such as communication (text, audio and video), polling/surveying and share or work together on any kind of digital content displayed on a common interface.

Distance Learning, Telematics and Rural Social Exclusion

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BACKGROUND

ADAPTthroughRATIO (AtR) was established to address social exclusion in the South West of the United Kingdom (Devon, Cornwall and Somerset) which has relatively weak employment opportunities. In this area, average earnings and disposable income are low, and the number of firms going out of business is high (ADAPTthroughRATIO, 1998). The Gross Domestic Product (GDP) per head in Cornwall is 71.2% of the UK average (and is the lowest in the UK), while 36% of employees are in part-time employment. Part-time work, geographical dislocation and low wages/job security are major problems throughout the rest of the South West region. The region has been affected by the decline of all its traditional industries (mining, farming, fishing and marine-related industries), as well as the reduction of the defence industries and services.

Almost all (90%) of private sector employees in the three counties work in companies of less than ten people, which is far higher than anywhere else in the UK. One significant consequence of this is that training diffusion from larger firms to smaller ones through both employee diffusion, and production/service networks between companies, remains low. Yet even these figures underestimate the extent of difficulties in most of the region. Most of the large employers are centred around Plymouth (the only significant urban centre in the South West) and the Eastern fringe (along the M5 motorway). The level of isolation and marginality in Cornwall, most of Devon and West Somerset is even more extreme than average for the region as a whole suggest (ADAPTthroughRATIO, 1998).

The empirical research that prompted the more theoretical questions addressed here has in part been reported already (David: 1999, 2001 and 2003). The research was an evaluation of a telematically delivered distance learning programme in the South West of the United Kingdom. The project involved the design of training packages to be delivered through a string of telecentres across Devon, Cornwall and West Somerset. The research involved interviews with product developers, telecentre managers, centre users and non-users in particular localities. Whilst the findings produced immediate conclusions, some more abstract questions

have emerged more slowly. Firstly there were questions of relative success or failure in facilitating distance learning. The findings suggested that while the technical infrastructure was successfully set in place, the social communication networks that operated through these new media were weakened by significant divergences of orientation amongst the key players.

Training product developers (mainly local colleges) saw telecentres in areas of rural marginality as weak markets. While funded to develop training products that could be networked to such centres, developers were free to pursue more lucrative markets, such as home computer users and larger firms with training budgets. Hence, the developers were not fully committed to the telecentres.

There was continual pressure on the Telecentre managers for operational funds. Most of the project budget had been consumed by the product development teams, and as products were to be delivered free to users, centre budgets were under continued pressure to meet these obligations. Telecentres were only given funding on the basis of outputs defined in terms of completed courses. This was not always what users wanted. Very often they wanted specific training for very specific applications which often had limited wider use. Further, the telecentres did not have the budgets to offer flexible opening hours or training as widely as they, and many users, would have wished.

Non-users often suggested they could not see the value of computer training in an area of low income, low skill and high seasonal employment turnover. Issues related to longer-term career development were considered as something of an abstraction that did not resonate with the work based conditions experienced every day.

The second and broader question arose in relation to the underlying assumptions behind a project that saw information access as the fundamental vehicle for overcoming social exclusion. The presumption seemed to be that the problem of social exclusion lay in ignorance, rather than in the structural conditions in which people lived. In other words, "It was in their heads, not their lives." There also appeared to be an assumption that the socially included (especially the experts and educators) were the solution.

In some contrast to this position, David (1999, 2001) has suggested that the socially included were as much the problem as they were the solution. The orientation of the socially included towards themselves (the product developers orientation to those able to pay) in and of itself generated social exclusion. Yet these orientations were reinforced by the very projects that claimed to be overcoming exclusion. For a researcher engaged in action research of this nature, a serious problem arises when the stated project "goals" become unclear or disputed during this course of the investigation.

This research was ethnographic in nature and involved spending time with users in their physical space for extended periods of relatively unstructured time, rather than interacting with them either online of solely through the medium of a structured questionnaire. The research was also designed as "Participatory Action Research" (PAR). Hence, it aimed to involve the "researched" in the design and analysis of the research, and was oriented towards facilitating the goals of the "researched" (Whyte, 1991; David, 2003;, David & Sutton, 2004). Work as a researcher in such situations can be problematic as the explicit action-oriented nature of the research is tied to facilitating the commonly understood goals of the project. Different interpretations of the project's goals can emerge (and did in this case) during the course of the research. While having a degree of discretion in the design and conduct of the research, the role of the action researcher also involves conflicts over who can be counted as a participant. Further, such an approach raises issues of actor motivation. In this particular case, we needed to examine what were the "goals" that the research was aiming to achieve? Were the priorities to be related to the goals of:

1. The coordinators, who wished to give a good account of themselves;
2. The product developers, who were motivated to make a product that could be marketed more widely than only to those that could not afford to pay;
3. The centre managers, who wanted to keep their centres open;
4. The individual or collective needs of the users; and
5. Those who did not use the centres, but might have done so if provision or publicity had been different?

The users were a self-selecting sample and this research also interviewed local non-users with the aim of identifying perceptions of need amongst this group. The inclusion of the voices of potential "participants" was seen as being important in this research which was grounded in "social inclusion/exclusion" as the mere act of participation itself was skewed towards the "so-

cially included." Was this legitimate? The question of "Who defines the goals?" comes to the fore once again. This also raises the question of the methodology of this type of social research and reflects something more general in supporting policy formation and implementation.

THIRD WAY POLICY-BASED RESEARCH AND ACTION RESEARCH

The Third Way offers a contradictory approach to politics and policy. On the one hand we are asked to believe that the Third Way represents a renewal of politics, whilst on the other hand it is suggested that it represents a movement beyond political vision (or ideology) towards a more practical and perhaps even de-politicised form of "problem solving."

The role of the social researcher in such a context, and indeed of research itself, is both elevated and confined. In a recent speech titled, "Influence or Irrelevance: can Social Science improve Government?" to the United Kingdom's Economic and Social Research Council (the largest source of social research funding in the UK), David Blunkett (then Secretary of State at the UK Department of Education & Employment) demonstrated this ambivalence (Blunkett, 2000). David Blunkett represented a Labour government, which had frequently announced its enthusiasm for social research. Researchers generally considered this in stark contrast to the attitudes of the preceding Conservative governments, which had seemed actively hostile towards most social research and favoured research based on rational economics. Blunkett's speech also outlined to the UK social research community the role it could play within the policy making process. He criticised social researchers for:

1. Research that did not take account of the political, economic or social realities that government faces;
2. Research that was aimed at "esoteric journals";
3. Research that did not start from and orient itself towards a "user focus";
4. Research that concluded with goals that are not "realistic or achievable."

He made it perfectly clear that research needed to be oriented towards solving problems within realistic parameters, rather than in the formulation of abstract and critical evaluations of social conditions or policy responses. Such abstraction and critique was "ideological" insofar as it is not pragmatic. While Third Way government claims to want to base its policy on sound research, researchers were asked to frame their research increasingly within the parameters of govern-

ment (and business) policy frameworks. Below I seek to show how Third Way social theory, the recent work of Giddens (1994, 1998; and, with Hutton, 2000) and Beck (1998, 1999 and 2000) in particular, while fitting the agenda of government, contains major contradictions and practical (problem solving) limitations.

CURRENT AND FUTURE TRENDS IN POLICY AND RESEARCH

According to the Third Way, with the provision of more information, individuals and government alike can increase their capacity for effective and reflexive action. However, this in itself can demonstrate an implementation paradox when government is very concerned to ensure the information it receives is tailored to its priorities, specifically excluding alternative policy views. One could argue that this is precisely what happens in the case of the socially excluded. The notion of the increasingly reflexive society, one capable of dealing with and effecting change at all levels, and of avoiding the constraints of structural determination (or the inhibiting effects of a belief in such constraints) goes to the heart of Third Way thinking.

However, this notion of reflexivity is ambiguous, in theory and in application. It is important to note that in their formulations of the concept of "reflexive modernization," Beck and Giddens (Beck, Giddens and Lash, 1994), in slightly different ways, distinguish individual reflection and institutional reflexivity (the later referring to system self-confrontation rather than individual conscious thought). They posit that the complex systems of social differentiation have moved beyond the regulative capacity of nation-state and nuclear family (each forged in the era of industrial modernity and now being undone). Beck calls this notion the sub-politics of technocracy, an ongoing self-undermining of systems. Giddens talks of the end of tradition and nature in similar terms.

However, Giddens and Beck are ambivalent about the relationship between such institutional churning and individual reflexive agency. Both see an intensified "individualisation" resulting from the erosion of class, community, family and career. However, while seeing these changes as largely driven by ongoing system and sub-system differentiation, rather than by choice or conscious actions, the emerging individual is also said to be a more reflexive, dynamic, empowered and "free" individual. Beck even goes so far as to suggest that social movements are merely the alarm bells of a revolution without a subject.

In more recent years, the emphasis has changed from one on the transformative force of differentiation, to the

increasingly reflexive individual. The build up and victory of New Labour in the UK representing the best watershed in this regard. In a fluid world, the flexible person thrives or at least survives. The flexible person needs a reflexive mind. The reflexive individual, increasingly required to operate in a world where less and less can be taken for granted, may be seen as victor or victim depending upon whether you ask how best to survive or look deeper at the condition they are expected to survive in. The former stance is the therapeutic one. The latter stance is the theoretical one. Of course if we restrict social research to policy related pragmatic action research we can only ask the former question (see David & Wilkinson, 2002).

What is it that we are supposed to "adapt" to? It is a curious irony that the emerging individual, bearer of reflexivity and choice, emerges entirely without choice according to Giddens and Beck (Beck, Giddens and Lash, 1994). They are the products of social forces that are supposed to have created conditions that will enable individuals to take control of their own lives.

AN ILLUSTRATION: SMALL FARMERS, INFORMATION AND FLEXIBILITY

An interesting illustration of this paradox in a policy context arose from research into the rural sector of the UK South West. Based upon the assumption that small farmers should be more computer literate, MAFF (the UK Ministry of Agriculture, Fisheries and Food) began placing ever-greater amounts of its information resources on the Internet, at the expense of existing postal and telephone services. This was supposed to make communication easier and more flexible for those who work long hours and would like to surf the Web at night, when all the MAFF officials are not generally available. Given that small farmers and farm workers are the least likely groups to have their own networked computer, the idea of increasing flexibility by such means was problematic.

Such flexibility was based upon a range of resources not available to all. Such assumptions of flexibility require resources to enable agency (i.e., the capacity to act-which in this case meant the resource of a networked computer).

Reflection upon one's lack of resources and exclusion generates depression and fatalism. Only reflection upon a resourceful position enables action. In the UK, increasing flexibility in the agricultural sector has been forced upon small farmers by the six largest supermarkets that between them control over 80% of

UK retail food sales. The flexibility and the reflexivity of the supermarket chains are very different from that of the small farmer/farm worker. While this was apparent to Giddens in the past (e.g., 1984), it appears less so today.

CONCLUSION

The development of telematic strategies for tackling the problem of rural social exclusion can very easily come to embody the very social characteristics that led to social exclusion in the first place. The assumption that social exclusion results from a lack of technical knowledge can lead to resources being handed out to technicians and educators, who themselves have very little understanding of the needs and experiences of the socially excluded. No amount of technical infrastructure is going to overcome the continued exclusion of those with less access to power as long as those with power continue to believe that it is possible to solve social problems without involving those currently excluded in the decision making process and in the definition of the problems to be tackled. It is not the case that distance learning via telematics is intrinsically an ineffective medium for training and communication. This again would be to assume that technology has a natural logic of its own (see David, 2005). The development and direction of technology is socially shaped, and it is important to address, and redress, the balance of social forces shaping technology if society is to successfully move towards the goal of social inclusion in this emerging ICT-enabled environment. Seeking to challenge social exclusion by telematic means will only come to reflect those forms of exclusion if practicality is narrowly defined and currently dominant social interests go unchallenged in the design and construction of technical and social systems.

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KEY TERMS

Action Research: Research that is designed not simply to establish the facts about a situation, but which is designed to facilitate the goals of the organisation being researched.

Participatory Action Research: A form of action research where the role of researcher and researched over-laps. This may mean that the researcher takes on a participatory role within the group, community or organisation being researched, or that the researched take a role in the design, conduct and analysis of the research. Often PAR does both.

Policy Based Research: Research that is designed to investigate issues that are of particular interest to the formulation of practical policy rather than more abstract theoretical interests. Policy based research is closely related to the notion of research based policy, whereby policy is said to be driven by well gathered empirical evidence. Supporters celebrate relevance and practicality. Critics fear the stifling of research that is not "practical."

Reflexive Modernization (Risk Society): The theory that we now live in an age of intensifying reflection at both the personal and the institutional levels, in a society in which tradition and other previously widely accepted elements of social life and nature are increasingly being undermined and lost. This theory is bound up with the view that information liberates and that we are no longer constrained by the shackles of gender, class and other sources of location and identification.

Social Exclusion: Term used to refer to all positions of social disadvantage. The term has come to replace talk of class in much government discussion of social disadvantage. The weak conception of social exclusion suggests that there is a need to include the excluded. Stronger conceptions of social exclusion seek to identify the forms of oppressive inclusion by which some are "excluded" from advantageous conditions.

Telecentres: Computer-based distance learning centres usually located in non-educational settings. Sometimes referred to as "telecottages" when in a rural location.

Third Way: Political ideology proclaiming the need to move beyond the supposed dogmas of rigid social regulation and total deregulation. For some this means a movement that abolishes traditional forms of state/community and free-markets. For others it has meant a fusion of both.

E–Africa Initiative for Good Governance

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INTRODUCTION

There is no doubt that the need for all around improvement of performance is very urgent for African governments and that ICT is valuable in decision-making, planning and management support in all sectors of the economy. In this regard, in Africa, there is a clear recognition of the opportunities than can be exploited using ICT within the framework of enhancing governance. As underlined by the United Nations Development Programme—Human Development Report 2001, *"Making New Technologies Work for Human Development"*, technology networks are transforming the traditional map of development, expanding people's horizons, and creating the potential to realize in a decade progress that required generations in the past.

E-GOVERNANCE IN AFRICA: CHALLENGES AHEAD

The integration of ICT in governance in Africa would have a strong impact on the life of all citizens. It can be a powerful engine for growth, competitiveness and jobs, while at the same time improving citizens' quality of life. But, of course, the scenario for integrating ICT in Africa's governance is difficult, and there are a number of technological and human barriers that threaten the exploitation of ICT. In short, the barriers against such initiatives are summarized by the weakness of the ICT infrastructure in Africa and the low rate of ICT penetration in administration. A number of initiatives and projects on ICT development in Africa are already under way. Many of the projects on ICT development led by International Organizations focus on financing technological infrastructure and providing assistance oriented to lower tariffs. New approaches aim to incorporate socio-cultural dimensions "placing the individual at the centre of development objectives" (UNESCO, 2001).

The centrality and importance of strengthening the political and administrative frameworks in African countries is therefore pivotal. Recent developments in ICT have however opened Africa up to exciting possibilities for public administration, in particular, and governance in general. The appropriate use of ICT in managing public services and governing state affairs has therefore become

a necessity. This is well recognized by the New Partnership for Africa's Development (NEPAD) and in particular by African Ministers with responsibility for the public service. The establishment of the e-Africa Commission of NEPAD, focusing on a range of areas pertinent to ICT implementation, from policy to e-applications, as well as the identification of good governance as a focus area for capacity-building within NEPAD, reflect the importance given to building the capacity of African states to function more effectively through the use of ICT.

As identified by the e-Africa Commission of NEPAD, the main challenges for integrating ICT in Africa can be summarised as follows:

- **Leadership:** Need for a clear e-vision; Capacity and will to lead change; Management and accountability structures.
- **People:** Appropriate skills and attitudes available at all levels; Availability of training programmes; Entrenching a culture of increased information access and transparency; Commitment to high level team work; Support for public service wide collaboration; Change management initiatives.
- **Policy:** Liberalised telecommunications sector and effective regulation; Policy environment supportive of growth of ICT adoption and use; Policy frameworks that secure freedom of information, privacy, security, intellectual property and copyright; Arresting the "brain drain".
- **Processes:** Identification of critical processes as well as improvement; Process adaptable, integrated and open to innovation; Monitoring and evaluation; Identification and adoption of best practices.
- **Technology:** Access to ICT networks, services and equipment; Development of local content in local languages; Ensuring that programmes drive ICT; Standard approaches to ICT infrastructure, to ensure scalability and interoperability; Privacy and data sharing; Authentication; Building user trust.
- **Stakeholders and Access:** Support for the need for "e"; Ownership across the board; Making information widely available to citizens; Utilising a variety of channels, including those owned and managed by the commercial and voluntary sectors (such as Kiosks and Call centres); Consideration of people with disabilities; Ensuring that any new channels

live up to high consistent standards of trust, confidentiality, security and accountability (PCs, interactive TV, cell phones, telephones/letters, etc.).

E-AFRICA INITIATIVE FOR GOOD GOVERNANCE: BUILDING E-GOVERNANCE CAPACITY IN AFRICA

In view of the overall commitment of the NEPAD Heads of State to stimulate the use of ICT as a driving force to foster social and economic development of the continent, and in respect of its mandate to support the improvement of the governance systems and the performance of the public service in Africa, in 2002, the African Training and Research Centre in Administration for Development (CAFRAD), in partnership with the United Nations Department of Economic and Social Affairs (UNDESA), and under the banner of NEPAD, launched the "e-Africa initiative for good governance: building e-governance capacity in Africa", with the aim to raise awareness and propose a way to find solutions on how to operationalize the role that ICT can play in the development process.

The "e-Africa initiative" focuses on drawing on the strengths in both good governance and ICT and wishes to provide an important contribution to the success of NEPAD's overall vision on Africa's development. Following the successful "e-Africa 2002: First Regional Workshop on Building e-governance capacity in Africa" (Johannesburg, October 28-31, 2002), organized by CAFRAD in partnership with UNDESA and under the auspices of NEPAD, the partners agreed on an overall Framework for Action, which was also presented to the 4th Global Forum on Reinventing Government (Marrakech, December 10-13, 2002). According to the e-Africa proposal and Framework for Action, the e-Africa initiative is composed by the main elements reported as follows.

• **Vision:** Inclusive and participatory African systems of good governance that are capable of exercising their powers and functions, delivering public goods and services efficiently and effectively in a transparent and accountable manner using ICT, to reduce poverty, redress inequality, promote sustainable development, foster security and fulfill social, economic, cultural, civic and political rights.
• **Mission:** To strengthen the institutional capacity of the African governance systems, especially that of regional, central and local government institutions, to improve policy making, coordination and delivery of public goods and services using ICT, in partnership with all stakeholders, complying to

high standards of integrity, efficiency, effectiveness, transparency, accountability, and responding to the needs expressed by their constituencies.

Strategic areas of support:

• E-Readiness;
• Enabling environment;
• Public participation and private sector engagement;
• Institutional capacity building; and
• Monitoring, learning and knowledge management.

Strategic objectives:

• Government as a catalytic force of social and economic development, empowering its institutions through the use of ICT to work together with civil society and private sector to meet the needs expressed by their constituencies.
• Accountable, efficient and effective processes for performing government administration, reducing transaction costs and enhancing policy coordination between the different government entities.
• Effective delivery of public services through efficient administrative and financial systems, ensuring quality, accessibility, affordability and sustainability.
• Increased capacity of government to engage in participatory and consultative decision-making processes with individuals, communities and organizations, by simplifying and increasing the interaction and transaction through the provision of online services and channels of participation.
• Reduction of space and time constraints between providers of public services and goods and those that make use of these through application of ICT.

Given the leading role of CAFRAD on e-governance activities, within the framework of the Pan African Programme on Public Administration and Governance, approved during the 4th Pan African Conference of Ministers of Public Service (Cape Town, May 4-7, 2004), CAFRAD, NEPAD and UNDESA, convened the "e-Africa 2003 Expert Meeting on building e-governance capacity in Africa" (Tangier, October 20-22, 2003).

The output of the meeting, organized with the financial support of the government of Italy, was the conception of the draft e-Africa Plan of Action, which outlines the set of realistic activities that can produce positive impact on political, economic and social governance in Africa, as specified in the "Framework for Action", and in pursuit of NEPAD priority programs. It is guided by the following strategic principles:

- Unleash the creativity of the African people and improve their living standards and choices;
- Meet national needs, as expressed by key stakeholders (national governments, citizens, civil society and business organizations);
- Support broader public sector reform and development;
- Give new impetus to the democratisation process and good governance; and
- Promote a peaceful and globally competitive Africa;
- Globally promote Africa's excellence and achievements.

The proposed Plan of Action is to be carried out taking into consideration two different levels of action: regional/sub-regional, and national. In particular, the initiative is based on the establishment of a partnership on regional basis, among regional and international partner institutions and African countries.

The activities to be carried out at national level will be in support of Governments' efforts on Administrative Reforms and on Building Indigenous African ICT Industry and Capability.

In fact, fully understanding the nature of ICT as a tool that can facilitate the desired change and transformation in governance, but by itself, cannot bring it about, the e-Africa Plan of Action calls on the African governments to continue their efforts aimed at:

- Developing a master plan for modernization of public administration, especially with the view to simplify administrative procedures; to make it results-oriented; to improve women participation and status in the public service; and, to promote professionalism and ethics in civil service within the framework of the African Charter of Public Service;
- Broadening of the social base for public policy decision making;
- Demonstrating a clear-cut commitment to the use of ICT in government operations; and
- Introducing systems for evaluation and quality control of public services.

Moreover, the long-term success of the e-Africa Plan of Action will depend on effectiveness of government efforts to:

- Build and standardize a robust and upgradeable ICT infrastructure;
- Promote development of indigenous ICT industry, including a system of incentives;
- Support local innovation, R&D, software and content development;

- Employ African entrepreneurs and enterprises as preferred contractors for design, building, production and delivery of outsourced public services;
- Encourage creation and support of ICT professional associations; and
- Promote export of African e-government expertise.

The draft e-Africa Plan of Action was presented for consideration to the First Meeting of the Pan African Committee of Ministers of Public Service (Kampala, January 28, 2004), held alongside the "Workshop on Public Sector Leadership Capacity Development in Africa", organized by CAFRAD, in partnership with UNDESA and with the financial support of the government of Italy, under the auspices of NEPAD.

In order to streamline and to ensure a consistent focus and efficient mechanism for success and accountability, the implementation of the Plan of Action will be coordinated by CAFRAD within the framework of the existing partnerships and programmes, working closely with the African ICT industry and sector.

CONCLUSION

In conclusion, despite the many indicators showing Africa at a disadvantage, the potential for growth through integrating ICT in the governance systems are encouraging. In particular, the key issue is how to build capacity to move towards an African knowledge-based society that will allow the enhancement of the economic performance of governments and public sector. African countries can enormously benefit of the use of ICT for its effective development. In addition to a faster management and analysis of the execution of decisions, ICT can especially support, at best, how each public administration intends to implement its activities, in relation to budget allocation, and how it thinks it ought to manage performance.

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KEY TERMS

CAFRAD: African Training and Research Centre in Administration for Development.

E-Readiness: Available technological, legal, institutional and human resources infrastructures and political will to engage in online activities.

Good Governance: The exercise of the governance authority with the participation, interest, and livelihood of the governed as the driving force (UNDESA/DPADM).

Governance: A multifaceted compound situation of institutions, systems, structures, processes, procedures, practices, relationships, and leadership behaviour in the exercise of social, political, economic, and managerial/administrative authority in the running of public or private affairs (UNDESA/DPADM).

Government: A public organization is part of a broader governance system. It is a means to a goal. These days, government is seen predominantly as a public organization set up by a society for the purpose of pursuing that society's development objectives. This comprises articulating the society's development-related demands, proposals and needs, aggregating them and implementing responsive solutions. Enjoyment of public consent constitutes the source of government's legitimacy. Transparency is a condition sine qua non for government's accountability vis-à-vis its oversight body (U.N. World Public Sector Report, 2003).

NEPAD: New Partnership for Africa's Development.

UNDESA/DPADM: United Nations Department of Economic and Social Affairs—Division for Public Administration and Development Management.

E

e–Bario and e–Bedian Project Implementation in Malaysia

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BRIDGING DIGITAL DIVIDES

The Malaysian government inspires the country to become a fully developed nation with an emphasis on knowledge-based economy by the year 2020. Though the government has been pushing aggressively for one household to own one computer and at least an Internet connection, it is difficult to see these desires and plans of the Malaysian government going beyond the borders of urban centres and small towns due to the limited infrastructure and amenities. In Sarawak, it has been noted that there are limited mechanisms to ensure that remote rural populations are able to get the same benefits as their urban counterparts due to its vast undeveloped areas and that the majority of Sarawak's population live in such areas. Harris (1999) has remarked that even though Sarawak's rural population was promised a full and equitable share in the benefits of national development, it has great potential to be sidelined in the nation's quest towards a knowledge society. This situation, if left unchecked, would produce an "unbridgeable" digital gap between the developed urban communities and the technologically impoverished rural communities.

Nevertheless, this situation should be considered as a temporary setback as recent developments in Information and Communication Technologies (ICT) have made it possible for the technologically impoverished remote communities to enjoy the benefits of connectivity which are now part and parcel of the lives of their urban cousins (Harris, Bala, Songan, Khoo, & Trang, 2001). It can be seen that comprehensive and extensive radical efforts are being taken by various agencies or governments to promote the use of ICT in rural communities. These efforts include the M.S. Swaminathan Research Foundation in India which had established six Village Information Shops enabling rural families to access and exchange information using ICT (Balaji & Harris, 2000), and Massachusetts Institute of Technology's (MIT) "digital town centres" in remote villages in Costa Rica (Harris, 1999).

These initiatives have spurred Universiti Malaysia Sarawak (Unimas) to conduct similar research projects to introduce ICT to remote communities in Sarawak, Malaysia. The first of the projects is the largely successful e-Bario project, and the second project is e-Bedian, which was modelled after e-Bario. The projects are an effort to understand how ICT can be used directly to achieve sustainable human development and improve the lives and livelihood of rural communities. These projects also aimed to identify the needs and opportunities which can be met by the innovative use of ICT through the facilitation of communication and access to information and knowledge resources in the areas such as agriculture, health, education, and general development. It is hoped that the research projects would provide learning opportunities, stimulate local capacity for informed decision-making to enhance personal, institutional and community development (Bala, Songan, Khairuddin, Harris & Khoo, 2002).

While the e-Bario and e-Bedian projects are of similar nature, there are lessons to be learned in comparing them, in particular, with respect to the different implementation approaches that were taken. Thus, this article aims to provide insights to the implementation of ICT projects in rural communities, insights which could be used as a guide for future projects.

GEOGRAPHICAL BACKGROUND

Bario and Long Bedian were chosen as the location for Unimas' research projects, as they are both extremely remote geographically (see Figure 1) and isolated from mainstream development. Both villages do not have basic amenities such as electricity, water supply and telecommunication. They rely very much on person-ally-owned generators, gravity-fed water system and rain water supply. The communities are completely isolated in terms of modern communication. Bario is accessible only by 19-seater Twin Otter aircraft while Long Bedian can only be accessed by river using long boat or by logging tracks on 4-wheel-drive vehicles. In addition to their remoteness, Bario and Long Bedian do not have 24-hour electricity supply. Their electricity is mainly supplied by generator sets running on expensive diesel—diesel fuel in Bario costs 6 times more than in the city, as fuel has to be flown in. The rationale for selecting such extremely remote locations was that, if the project succeeded in these "worst possible" contexts (in terms of remoteness), then future projects would be relatively easier.

The Bario community is made up of about 1,000 Kelabits. The majority of them are Christians (97.9%) with a small group of Muslims (2.1%). The population is mainly aged between 31-60 years old (72.9%), with about 83% of the population in the actively working group age. Farming is the main occupation of the Bario community with an average income of approximately RM500 (USD 132) per month. About 19% of the population have completed primary education, 27% lower secondary education, 20.7% upper secondary education and only 0.7% tertiary education. About 29% of the population had not attended any formal schooling before.

The Long Bedian community on the other hand, comprises several ethnic groups, such as, Kayan, Kelabit,

Figure 1. Location of Bario and Long Bedian in the State of Sarawak, Malaysia

Kenyah, and Punan. The population of Long Bedian consists of about 1,700 people, majority of them are between one to 35 years old. Approximately 32.2% of the population have completed their primary education, 27.1% secondary education and only 4.9% tertiary education. About 35.8% of the population had not attended any formal schooling before.

The Long Bedian folks are mainly farmers (68.4%), Government servants and small business operators. The average monthly household income in Long Bedian is RM830 (USD 218).

APPROACHES AND IMPLEMENTATION

e-Bario was undertaken in the wake of the government's adoption to use ICT as the base for national development. Picking up on this cue, the researchers from Unimas decided to embark on the e-Bario project beginning with the school. The school was chosen first, as it already had the infrastructure (building and day-time electricity supply). It also provided a platform to train and prepare not only the teachers and students but also the community. Besides the school, the e-Bario project also provided Internet and computer access to the community through a telecentre.

Prior to the e-Bario project, difficulty was initially faced in identifying an approach to bridge the digital divide as this was one of the first pilot projects in Malaysia. After much research done on the approaches to be used, and taking cues from experiences shared by Anderson, Crowder, Dion and Truelove (1998) and Garcia and Gorenflo (1998), the researchers decided to employ the active Participatory Action Research (PAR) model. Anderson et al. (1998) and Garcia & Gorenflo (1998) stated that the focus should be on the people and the process, and not the technology. Much emphasis is also placed in understanding the context of the social, economic and political systems where the technology will be employed. Anderson et al. (1998) remarked by quoting the Food and Agricultural Organisation of the United Nations (FAO) (1995) that continuous dialogue and consultation with the community should be held to facilitate participatory problem analysis and development planning. These steps taken would ensure information flow, and empower the community to take control of their own development process.

Anderson et al. (1998) further warned that ICT awareness, familiarisation and literacy training have to be provided to the community, or else the telecentre stands the risk of being "alien" to the community, with the community neglecting it and not wanting to own it. The

Figure 2. The e-Bario implementation framework

local community has to be trained and awareness instilled in them to take up the responsibility for the operation, management and maintenance of the telecentre.

Realising the importance in engaging and empowering the community, it was deemed necessary that the community take an active role in the e-Bario project. A framework (depicted in Figure 2) to implement the project was then identified and carried out, as outlined by the following steps:

1. **Feasibility study:** Conduct a feasibility study to determine if project meets the requirements, and identify issues to be considered during implementation.
2. **Community discussion:** Conduct a dialogue with the community to share the idea with them.
3. **Community participation:** Get the community involved in the planning by encouraging them to share their views, opinions and ideas. Then, convince them to accept ownership and be committed to the project. A steering committee comprising members of the community is to be set up to steer and take ownership of the project.
4. **Baseline study:** A study needs to be conducted with the help of community members to understand and

to outline the social, economic and political systems, and needs of the community.

5. **ICT literacy training:** Once the baseline study is conducted, ICT literacy awareness and training programmes need to be conducted for the community in order for them to effectively utilise the technology provided.
6. **ICT provision/deployment:** After the community has been given ICT training, the telecentre can then be fully deployed for the community to utilise.
7. **Community development:** Ideas and development plans that have been planned for the community through the deployment of the technology can now be looked into.
8. **Research and development:** The researchers would then need to conduct impact studies on the deployment of the telecentre and look into further development opportunities, particularly in self-sustaining the telecentre in the future.

The framework also identified what the telecentre aims to provide:

- Increased ability to communicate with the outside world, maintain and promote links between members of the community
- Increased access to information and communication in relation to:
  - General knowledge
  - Education
  - Health
  - Agricultural practices
  - Government
  - Recreation and entertainment
- Online promotion of the local community, culture, village, locality
- Opportunities to develop cottage and light industries

The researchers have identified the approach in the e-Bario project as the "Bottom-Up Approach." The key essence of this approach is that the community must want to own the project. The people are the "driving force" to propel the project to further development and sustainability.

e-Bedian is an offshoot of the e-Bario project success. The approach and implementation for this project was to be based on the e-Bario model. However, unexpected events altered the planned approach (as described in the next sections).

PROJECT AND APPROACH EVALUATION

The e-Bario project took a good two-and-a-half-years to be fully implemented with the initial work beginning in 1999. Numerous lessons were learned through trial and error throughout the project, particularly problems attributed to the limited transportation. Nevertheless, every step of the Bottom-Up approach was followed through intensively, with the community being involved right from the beginning. Discussions with the community and community leaders were held repeatedly (not on a one-off basis) until they really understood and appreciated what they were committing to. The people were initially engaged in the identification of problems, and they were also involved in finding the solutions to the problems (Bala, Harris & Songan, 2003).

After a year from the start of the project, the first computers were brought into Bario. The teachers and the community members were trained. The teachers eventually became trainers themselves and trained the students at the school. The teachers and the students, then indirectly helped train the community. After two years of project initialisation, Internet access was brought in. The connection to the Internet is via a solar-powered VSAT satellite system. The students were able to access the Internet from the school labs. A telecentre was then built to provide Internet and computer access to the community. The telecentre was set up near the shops, as members of the community frequently visited these shops. Volunteers were easily obtained to manage and maintain the telecentre. There is daily occupancy in the telecentre, and the users were charged a nominal fee which went towards the maintenance and management of the telecentre.

Today, four years after the inception of the project, the computers at the school are being fully utilised by the students and teachers. In addition, the computers at the telecentre are being used by the community for communication with families and friends, as well as for conducting their businesses. In particular, some lodge owners were using the Internet to communicate with their clients in booking accommodation and transportation. Trek guides and porters can also be reserved by e-mailing the lodge owners.

Unlike e-Bario, the e-Bedian project was initiated by a community leader of Long Bedian, who is the State Assemblyman for that constituency. Initial discussions between the statesman and Unimas were held at the end of 2002, and took about two to three months for Unimas to clearly explain the purpose of the telecentre, and the Bottom-Up Approach. A feasibility study was done and the village met the requirements needed for the telecentre to be set up. Unimas researchers then committed themselves to the project and identified a period of eight-12 months to conduct dialogues with the community, getting them involved in the planning, and to conduct a baseline study. The baseline study was to be conducted to understand, and outline the social, economic and political systems and needs of the community, in order to deploy the technology effectively. Plans to seek financial grants to support the project as well as to provide the community trainers with the necessary ICT awareness and training were made.

The whole plan however took a sudden turn, when the then Prime Minister of Malaysia (PM), the Honourable Datuk Seri Dr. Mahathir Mohammad, decided on short notice (three weeks) to visit Long Bedian and officiate the opening of the telecentre. The news came as a shock to the researchers, as the telecentre was far from ready. Moreover, they did not anticipate Steps 2-5 of the approach to be skipped completely. Nevertheless, since commitments were already made to the PM, things had to be done, and done fast. While the community built the physical structure of the telecentre, Unimas looked for sponsors for the computers. Little did the researchers realise that the PM's name could carry such weight. Within two weeks, more than 20 computers were supplied, each with a colour printer. The VSAT Satellite system, (which took close to six months to apply for and then installed in Bario) was completed in less than two weeks in Long Bedian. Everything appeared to progress without much difficulty. The PM came, officiated, and shared his views on the roles the telecentre and ICT have in the rural regions. Immediately after the launching week, a baseline study, and ICT awareness and literacy training were conducted for a week with some of the community trainers identified by the statesman. Unfortunately, commitment for the training was quite poor. Attendance was usually half, with only the women folk turning up. This was the beginning of many unforeseen problems.

The planned dialogue sessions with the community never took place, as the statesman and the community were busy with their daily tasks and responsibilities. Nevertheless, a steering committee had been set up, with the statesman as the advisor. The committee however seemed inactive as two attempts were made to meet the committee members and discuss issues relating to the telecentre. They appeared reluctant to meet and make decisions without the statesman's presence. Efforts to identify someone from the community to manage and maintain the telecentre often failed even though there were volunteers as the statesman wanted to identify and appoint the person. Instructions and decisions were passed top-down from the statesman to the committee. Thus, the researchers decided to call the e-Bedian project approach the "Top-Down Approach."

Today, after nearly a year of setting up the e-Bedian telecentre, the telecentre has yet to have a manager to manage, and a technician to maintain it, like in Bario. The community has yet to fully receive ICT-awareness and literacy-training, as not many want to be committed to this. The problem identified is that they do not see, understand nor appreciate the importance of ICT in their daily lives. The warning identified by Anderson et al. (1998) as highlighted in the beginning of this section can now be seen. The telecentre is an "alien" white elephant to the majority of the community.

The project has yet to secure any financial support from any agencies to pay the Internet and satellite system bill. The company hosting this service has been generous enough to hold back the bill for a few months till some form of financial support could be found.

Nevertheless, the statesman, in his own capacity as a representative for his constituency, had arranged for various community leaders around Long Bedian to undergo ICT awareness and literacy training at the telecentre. The trainers were from the State government's ICT Unit.

All is not lost, however, as the payphone service in the centre is highly utilised. On weekends, the queue for the telephone can sometimes stretch up 200 metres in the evening, and there are at least 50 users making daily phone calls to towns like Miri, Kuching and West Malaysia. The telecentre is in good condition and still accessed by a limited number of users.

RECOMMENDATIONS AND CONCLUSION

Based on the researchers' observations and analysis, it is recommended all steps of the Bottom-Up framework should be carried out, especially steps 2 and 3, that is, community discussion and participation. The community (at the grassroots level) should also be empowered to think and make decisions; not just by community leaders. Furthermore, the community and the researchers should be given sufficient time to ensure "buy-in" of the project by the target community.

To sum up, the Bottom-Up approach identified by the researchers appears to be more effective and useful, compared to the Top-Down approach. Experiences from both the projects have demonstrated that ICT and Internet cannot be just "dropped" in a rural village, without raising proper awareness, familiarisation and literacy training. In other words, technology alone cannot bring about change. The power lies in the community itself. The community must be involved in identifying and solving the problems they face, as well as implementing the solutions found. Doing so will result in a sense of ownership to the solution and commitment to the project. Though the long-term effects of the project and the Bottom-Up Approach are not clearly apparent, the achievements of the e-Bario project suggest that the participatory Bottom-Up approach is a prerequisite for success and sustainability.

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KEY TERMS

E

Bottom-Up Approach: Proceeding from the bottom of a hierarchy or process upwards. This approach involves the community first at the start of the project.

Digital Divide: The ICT (telephone, computer and Internet access) and related services, ownership and access gap that exists between those in the urban areas and those in the rural areas.

ICT: Acronym for Information and Communication Technology. Includes computer software and hardware, as well as communication technologies such as telephones, and the Internet.

Knowledge-Based Economy: Economy that thrives because people have the necessary knowledge and skills.

Telecentre: A public-access facility providing electronic communication services, especially in marginalised or remote areas where ICT are not prevalent. Computers and networking facilities are normally available in the telecentre.

Top-Down Approach: Initiating from the highest level of a hierarchy, down to the grassroots level. Opposite of bottom-up approach.

VSAT: Very Small Aperture Terminal. A transceiver used to receive signals from and transmit signals to the satellite.

E–Business for SME Development

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THE CURRENT SITUATION

In recent years, information communication technologies (ICT) have become accessible throughout the world, and appear to overcome both distance and time (Cairncross, 1997). ICT affects not only individual citizens, but also companies of all sizes and across all sectors. Of all the benefits of ICT use, the most important appears to be the improvement of competitive capacity by removing geographical and time barriers. SMEs that use ICT hope to increase their market share, achieve growth and overtake their competitors. But does better competitive capacity also have an impact on local and regional development (LRD)? And does LRD have an impact on the economy of a country and the limit of a nation? The ICT/regional development challenge is a sizeable one, since the two elements evolve at very different speeds-ICT evolves quickly, while regional development is achieved slowly.

Regional development at both the economic and social levels extends over a given area, within a well-identified space. The people living within the region have shared interests, goals and needs. They share, co-operate and collaborate between themselves and with the region's stakeholders and businesses. The principal concepts underlying their actions are autonomy, partnership, solidarity, a sense of belonging, inter-personal and inter-company networks, creativity, innovation and so on. Regions, like businesses, must live with competitors both near and far.

If we look at all these elements, ICT in general and e-business in particular[1] may well be powerful factors in local and regional development, playing an innovative role in an economic sector where both time and distance have been redefined. E-business can also generate new economic activities, new products and new services. It constitutes a vital part of the new economy, which is composed of high technology, multimedia and dot.com firms.

Throughout the industrialized world, a number of ICT and e-business initiatives have been proposed to support and accelerate LRD (EuroCom, 2002). For example, some governments have proposed projects that will enable them to follow the pack, while in other countries projects have emerged from the bottom up, through regional and local economic portals or electronic markets.

Québec's SMEs face the same competitive situation as their larger counterparts. To preserve or increase their market share and improve their competitive capacity and performance, they must be able to direct their actions and acquire the right tools. IT may well be a solution; by abolishing boundaries, IT enables firms to extend their zone of influence beyond their normal perimeter and improve their quality by addressing the time factor and the fluidity of supply chain, production and delivery operations. E-business could lead to the creation of a global network of contacts between business partners. However, to benefit from these possibilities SMEs must acquire new skills and adapt their business models to suit their new electronic activities.

Canada compares favourably with the United States and the European Union as far as e-business use by SMEs is concerned (ICCE, 2003), in that half of all Canadian SMEs use e-business. However, it is also true that more than a quarter have no intention of doing so. Why is this so, when the competitive capacity of the Canadian and Québec economies depends on the speed at which SMEs are able to adopt e-business technologies? Innovation, training, information and networking all have an impact on SME development in the new economy (Julien, 1997).

This article describes a study of e-business and ICT use by SMEs in the Mauricie region of Québec, Canada. Its main purpose is to throw light on technology use and look at how LRD could be stimulated through the provision of proper support for SMEs. It begins by examining the main obstacles to e-business use, along with various initiatives, and goes on to propose a model of ICT policy

initiatives for LRD. It also presents the methodological considerations of the study, explains its principal results, identifies some solutions, and proposes avenues for future research.

OBSTACLES TO E-BUSINESS USE

Over the years, researchers have produced large numbers of reports, surveys and studies of ICT and e-business use by SMEs. Generally speaking, the percentage of computer and Internet use among SMEs is very high. In Québec, however, SMEs are less present on the Web and are much less likely to use e-business technologies, especially e-commerce.

Overall, Québec lags behind the Canadian average for e-business use (Poussart, 2002). Nevertheless, the current trend is clearly an upward one, and is expected to continue and even accentuate in the coming years. The interest in SME development, and its impact on local and regional economies, is therefore not surprising.

Recent research has identified a number of obstacles encountered by SMEs wishing to adopt IT and e-business (see among others Bégin et al., 2000; ICCE, 2003; Mora-Monge et al., 2001; Poussart, 2002; TableRonde, 2001; Terry, 1999). Briefly, the most commonly mentioned obstacles relate to security and confidentiality, lack of proper business models and business plans, a negative perception of e-business technologies among owner-managers, a lack of enthusiasm for e-business among customers and suppliers, legal issues, absence of access to broad band network infrastructures, lack of e-business skills and expertise, little or no qualified human resources, and absence of appropriate technologies.

SMEs also have some specific features that set them apart from large corporations. A better understanding of SME mechanisms may therefore reveal some of the reasons for the existence of so many obstacles. Among other things, the lack of knowledge and experience in SMEs appears to generate high levels of uncertainty concerning new technology environments and the use of ICT for managerial, strategic or competitive purposes, thus explaining, at least in part, why SMEs are currently lagging behind the big business sector in terms of e-business use. Similarly, most of the difficult e-business-related experiences reported by SMEs are due directly to their intrinsic characteristics, namely their small size, centralized management, lack of organizational specialization, intuitive strategic planning and simple internal and external information systems (Julien, 1997).

Encouraging SMEs throughout the world to adopt e-business technologies is therefore a considerable challenge. Various programs and initiatives for SMEs and economic stakeholders have been devised to overcome these obstacles[2]. In this article, we present a model of a logical path for SMEs with little ICT knowledge that are moving towards total integration of future business possibilities through ICT. The model also reflects the previously identified factors that influence the development of SMEs in their respective regions.

The model contains three axes, presented in the form of a continuum in Figure 1. The first axis is the type of initiative or level of structure provided by public agencies. The term "awareness-raising" refers to a low level of structure, while "structured intervention" refers to more detailed policies and measures, along with specific initiatives for firms. The second axis represents the size of the target client group, ranging from generic action (targeting all the region's economic stakeholders) to specific action. The third axis covers the economic development of the region or area-in other words, the impact of ICT initiatives on LRD.

The model's logical path comprises four main steps, characterizing past and present LRD initiatives involving e-business:

1. Raise firms' awareness of networking and electronic business: emphasize the benefits of e-business by providing information (public agencies developing or implementing policies for the region's economic stakeholders).
2. Develop an environment conducive to ICT use at the venture creation stage: implement programs that stimulate the economy by triggering new venture creation (e.g. the new economy marketplace program and other general initiatives aimed at all businesses).

Figure 1. Logical model of LRD initiatives involving e-business
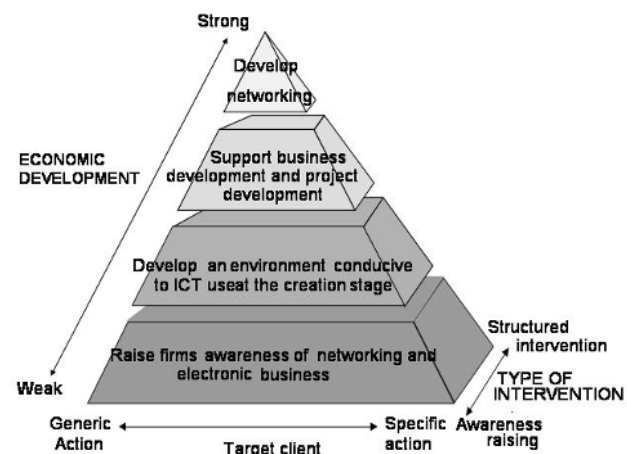
3. Support business development and project development (aid program, financial assistance program, etc.);
4. Develop networking: enable firms to do business between themselves, individual and collective initiatives (collective networking needs and needs specific to individual firms, supported by policies or programs).

These four layers constitute the logical path for SMEs with little ICT knowledge that are moving towards total integration of all future business possibilities through ICT. Each step achieved is more important than the next step (due to the learning and costs involved). The model, when applied, contributes to LRD. As SMEs learn more and incorporate more electronic tools into their activities, they are better able to contribute to the economic prosperity of their region.

In the following sections we will begin by presenting the research methodology, and will then go on to examine the model's application in the Mauricie region of Québec, Canada.

RESEARCH METHODOLOGY

The unit of analysis for the study was the Québec SME, and the sample was composed of SMEs from the Mauricie region. The Mauricie region is one of 17 administrative regions in Québec, and is located between the province's two largest urban centres, Québec City and Montreal. It is considered representative of the province as a whole, and has an approximate population of 260,000 inhabitants scattered over a territory of 40,000 km^2.

The Mauricie region is dependent on the pulp and paper industry, which has been in decline for the past 15 years. The other economic sectors, including the service sector, have grown to some extent, but the unemployment rate in Mauricie is still the highest of all Québec's regions. In recent years the Mauricie region has undergone an economic and regional restructuring that is expected to generate new venture creation, especially in the high technology sector. The region's cultural and social development has been slow despite the IT and e-business revolution.

Our research took the form of an exploratory field study involving a questionnaire-based telephone survey (34 statements) and two focus groups held between December 2002 and January 2003. In view of the length of the questionnaire (a 30 to 45-minute interview), a small sample of 64 SMEs was selected from all the sectors identified by Statistics Canada. Each member of the research team contacted one SME in each sector, and most of the responses were obtained directly from tele-

Table 1. Summary of survey results

Networking in the Mauricie Region	SME
Members of an association	65 %
Wanting to join a new electronic network or not	74 %
Use of one or more portals	7 %
Suppliers with a business portal	20 %
The Region's Technological and Social Infrastructure	
Use of at least one computer	83 %
Access to a high-speed connection	33 %
Access to a modem	41 %
Use of an Extranet	16 %
Existence of an Intranet	13 %
Existence of a website	46 %
Internal hosting	12 %
External hosting (service provider)	34 %
Planning to develop a website within a year	22 %
Website developed internally	63 %
Website developed by external services	21 %

E-business use by SMEs	SME
Use of EDI	29 %
Information exchanges with suppliers	57 %
Information exchanges with customers	71 %
Information exchanges with financial institutions	49 %
Information exchanges with governments	44 %
Knowledge of government e-business support programs	11 %
Website types: Information	95 %
Transactional	42 %
Online payment	21 %
Internet provides economic or social benefits for firms in general	8 %
Internet provides economic or social benefits for their firm in particular	62 %

phone calls. A total of 56 questionnaires were completed, for a response rate of 87.5%.

The first focus group was composed of 13 regional development actors working directly with SMEs, while the second was composed of 12 SME entrepreneurs from different sectors and firms. In both the questionnaire and the meetings, a qualified statistician approved all the methodological aspects of the approach used.

ANALYSIS OF RESULTS

The results of the survey are presented in Table 1. The results of the two focus groups are set out under the

headings of networking, regional infrastructure and e-business use by SMEs.

Networking in the Mauricie Region

The inter-firm networking culture in the Mauricie region is fairly weak. The SME owner-managers surveyed had not grasped the benefits of networking and spent very little time on it, believing that network groups would not help them solve their problems. They felt IT and IT-based networks were useful only in certain sectors and for specific products and services. They also thought networks and partnerships should be used to attract new firms to the region. However, they did admit that some projects could only be brought to fruition through networking. They were aware that IT could help relieve problems related to distance, but still considered face-to-face contact to be crucial in business.

With regard to information collection and management via the Internet, no established business practices and no e-business success stories were identified that would have a positive impact on other SMEs. Indeed, most of the owner-managers consulted spoke only of their failures. They felt they were not sufficiently trained in IT use. As previously stated, training, information and networking are very significant obstacles to the emergence of a new economy in the Mauricie region.

The region is characterized by a weak networking culture, confirming the findings of Julien et al. (2001). SME support from LRD stakeholders is also fragmented and uncoordinated. Few of the stakeholders use IT to establish or facilitate networking between themselves and the region's SMEs.

The Region's Technological and Social Infrastructure

The technologies used most commonly to contact suppliers, customers and governments appear to be the telephone and the fax. SMEs in the Mauricie region use

Figure 2. Characterization of the Mauricie region
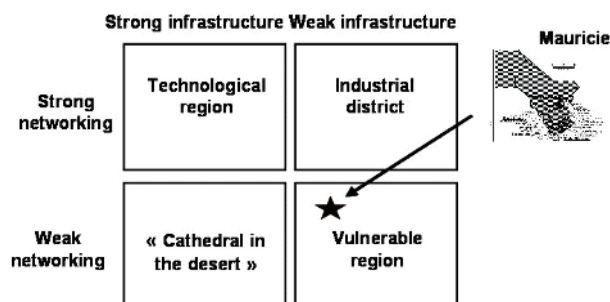
the Internet for information searches, watch activities and in some cases to improve their business practices (benchmarking).

Basically, the Mauricie region is characterized by its deficient technological infrastructure. SMEs have only limited access to broadband services (high-speed Internet). Internet service providers and e-commerce application suppliers are few and far between. As far as human infrastructures are concerned (Website and IT specialists), they, too, are rare. There is clearly a need for training and upgrading in the region. Figure 2 presents a characterization of the Mauricie Region.

E-Business Use by SMEs

Many of the SME owner-managers surveyed said they were not keen to use e-business technologies because the Internet was not secure enough and intruded too much on the privacy of individuals and organizations. They also felt they lacked e-business training and skills. They did not think e-business was appropriate for their products or services, and in addition felt unable to cope with increased sales because they lacked the necessary investment resources. Many questioned the potential return on investment of e-business projects. They were also aware that e-business use would force them to restructure their internal processes and business practices, a task they were not prepared to undertake.

Briefly, then, very few of the region's SMEs use ICT and e-business in their business models. Many still use the telephone and fax as their main or sole means of communication with customers and suppliers. Other problems have also had negative impacts, including the absence of e-business success stories, limited access to high-speed Internet services, insufficient training and information on ICT and e-business, and the lack of an ICT culture and inter-SME networking tradition.

PROMISING INITIATIVES AND CONCLUSION

One way of promoting and supporting LRD in the Mauricie region would be to create conditions that would help SMEs to become more productive and competitive on today's markets. The results of our survey and focus groups clearly show that the region's SMEs will not be adopting IT and e-business technologies in the near future. Obviously, they cannot join the new economy if they do not acquire the right tools. The tools they need can be divided into three main categories, namely networking, technological and human infrastructure, and ICT/e-business training.

Better networking would enable the SMEs to exchange information and knowledge between themselves. They could then work together to create collective resources and skills. The region's LRD stakeholders would be able to work together more effectively, in a more coordinated way, to meet the firms' needs, thus helping to create a dynamic conducive to development and entrepreneurship.

A better technological and human infrastructure would help the SMEs to obtain easier access to high-speed Internet services throughout the region. LRD stakeholders would then work with the SME owner-managers to attract people with IT experience, and would also devise ways of attracting entrepreneurs and employees to the Mauricie region and convincing them to stay.

Proper ICT and e-business training would enable SME owner-managers to take a positive, open-minded and proactive view of ICT in their everyday business dealings. To achieve this, a range of network-based training and information activities would be required, so that owner-managers are able to understand business practices in the new economy. Such activities would cover the strategic and technological aspects, business restructuring, technology watch, electronic training and so on. The SMEs would have easy access to proper means of communication and rich information. They would also be able to maintain their current markets while positioning themselves to be competitive on new markets.

Based on our model in Figure 1, there are a number of initiatives that would meet the training, awareness and networking needs of SMEs. One solution would be for local development and economic stakeholders to prepare an ICT usage guide for the region. Another possibility would be to organize networking days or conferences on ICT-related subjects proposed by SME owner-managers. Clearly, this list is by no means exhaustive, and many other possibilities also exist. One extremely promising initiative would be to create a regional electronic business assimilation portal for the Mauricie region, covering all the elements mentioned above (see Figure 3).

The portal prototype shown in Figure 3 is based on the needs expressed by the region's entrepreneurs, and takes local and regional features into account. Its purpose is to help SMEs and local development stakeholders to find solutions to their information, training and networking problems. It could also stimulate the region and its development through inter-SME networking, trend charts and other networking tools.

This solution could be implemented within a realistic timeframe, and would target particular categories of SMEs to ensure its success. For example, every month a successful case of e-business use by a SME would be featured in the "Regional Showcase" section, allowing

Figure 3. Screen copy of portal prototype
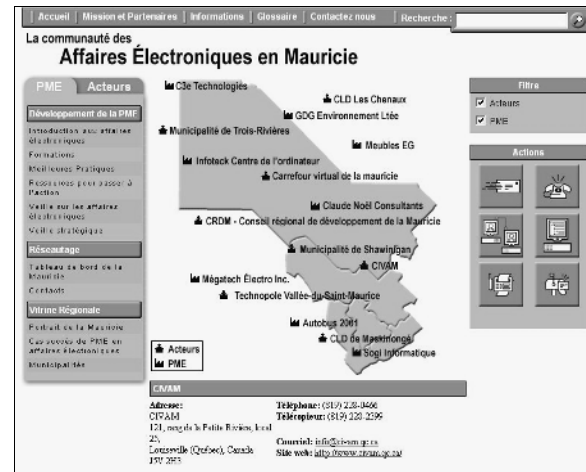
the featured firm to forge business contacts with partners both inside and outside the Mauricie region.

Such an initiative would have to be promoted on a top-down basis and be accepted, assimilated and required by the base, that is, by the SMEs themselves. It would allow for maximum use of networks and IT as facilitating tools. A credible stakeholder would have to be carefully chosen to act as leader and to promote and implement the solution. Lastly, to be successful, the portal would have to have the support and participation of a wide range of stakeholders, along with financial assistance from the community and government authorities.

Perhaps the new portal would lead to the creation of a met@network, i.e., a virtual regional space for knowledge management, information exchanges and joint knowledge development. The networks formed by a region's SMEs and stakeholders have been described as extremely rich pools of explicit and tacit knowledge that are presently under-exploited (Julien et al., 2003). With the potential offered by ICT, it may well be possible to build a regional intellectual capital and make it available in real time to all members of the met@network. In addition, the met@network members could perhaps be encouraged to join virtual joint knowledge development processes, to speed up individual and collective problem solving and innovation. All these possibilities will be examined in more depth in future research.

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KEY TERMS

Business Network: A group of economic players formed with a view to exchanging services and information through off-market contacts. There are three types of networks: (1) networks of partners, composed of suppliers, customers, producers or distributors; (2) networks of experts; and (3) titular networks that support business development through government services and programs

(Julien, 1997). They are basically collaborative, and decisions must come from the bottom up. Size, purpose and structure can vary. Business networks have been in existence for some time; the "new" element is the availability of tools for designing and creating them.

Electronic Business (E-Business): In addition to e-commerce activities, e-business includes all other types of information exchanges. For example, firms can use electronic means to distribute information and provide after-sales service-in other words, "business" activities as opposed to strictly "commercial" activities.

Electronic Commerce (E-Commerce): The use of electronic transmission (telecommunications) for exchange, sale and purchase of goods and services. E-commerce involves a transaction.

Information and Communication Technologies (ICT): Electronic reading, storage, processing and transmission technologies.

Local and Regional Development (LRD): A two-dimensional phenomenon involving the human element (active or inactive, economically involved in society or not) and the individual and overall enrichment of the region's players.

Networking: A business practice that allows owner-managers to join associations and groups composed of at least three firms that pool their strengths to realize projects at the regional, national or global level that could not be achieved by a firm working alone. For example, firms that work together are able to take advantage of group access to resources skills and competencies.

Portal: A virtual meeting space where firms come together to exchange information, trade or collaborate. There are three different types of portals: information portals, transactional portals and cooperative portals. These types can be classified according to "orientation criteria" into vertical portals (firms in the same industry or sub-industry, grouped by function), horizontal or functional portals (firms grouped according to their shared needs, regardless of sector) and geographical portals (firms grouped geographically by region or country).

ENDNOTES

[1] The term e-business is used in a more general sense to refer to the information, transactional and relational aspects of business. For example, e-commerce is a transactional aspect (Greenstein et Vasarhelyi, 2002:2).

[2] For example in Great Britain, the Merseyworld (www.merseyworld.com) SME portal, and in France in the Nord-Pas-de-Calais region (www.declic.net).

E–Commerce and Small Business in Regional Australia

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INTRODUCTION

E-commerce is considered to provide substantial benefits to business, particularly small business. It enables new ways of working to emerge and facilitates an organization's reengineering. Benefits from e-commerce can be argued to be greater for SMEs (small and medium enterprises) since traditionally they have operated in an uncertain and dynamic environment (Murphy & Daley, 1999; Nooteboom, 1994). Despite this, SMEs generally and especially those in regional areas in Australia, are lagging behind in their adoption of technology, including e-commerce.

A majority of Australian SMEs are unaware of the opportunities presented by online business as well as the associated risks. SMEs especially tend to be ill-prepared for entry into global markets. The following table (Table 1) shows the use of information technology by Australian businesses.

Table 1. Australian businesses using information technology (Source: Australian Bureau of Statistics 2003, Measures of a knowledge-based economy and society, Australia Information and Communications Technology Indicators - Proportion of businesses with computers, Web sites and Internet access by business size)

Business size	Businesses using computers	Businesses with Internet access	Businesses with a web presence
	%	%	%
No. of employees			
0–4	79	65	15
5–19	91	80	34
20–99	98	93	55
100 or more	100	99	81
Total income			
Less than $100,000	75	60	11
$100,000–$999,999	84	71	22
$1m–$4.9m	96	88	45
$5m or more	100	96	69
Total	84	72	24

Examination of the data in Table 1 shows that a relationship exists between the size of a business and the likelihood that the business is using information technology. As employment and income size increase, so does the proportion of Australian businesses making use of information technology. In June 2002, virtually all large businesses (those employing 100 or more persons) used computers (100%) and had access to the Internet (99%), while 81% had a Web presence. In contrast, very small businesses (those employing fewer than five persons) had a lower level of IT adoption: 79% used computers, 65% had access to the Internet and only 15% had a Web presence. According to Korchak and Rodman (2001), it is probable that only about one-third of Web-enabled SMEs had any form of Web strategy, with sites predominantly a means to share information rather than enabling online ordering, procurement and other aspects of e-commerce.

This article focuses on the issues concerning the uptake of e-commerce by a particular small and medium enterprise (SME), located in Hervey Bay, Queensland, Australia. The case study SME has identified a strategic opportunity to serve a niche market that is largely international in nature. This direction has enabled the business to improve its performance as it changes to meet the needs of the marketplace. Before this study can be fully understood however, a review of diffusion of innovation is required.

DIFFUSION OF INNOVATION

Diffusion is defined as the process by which an innovation is communicated through certain channels over time among the members of a social system, in this case SMEs (Kendall, Tung, Chua, Ng & Tan, 2001; Knol & Stroeken, 2001). It is considered that there is a lower level of awareness and a different message "shared" via the social system in which regional SMEs are immersed which affects diffusion.

The process of adopting and implementing innovative products such as Internet technology and electronic commerce can be considered in terms of a number of diffusion of innovation models described by Rogers (1995), Burgelman and Sayles (1986), Rothwell (1992) and others. Rogers argued (1995) that the adoption of a new product/technology is a decision process that moves through stages from awareness to adoption. Emergent models however argue diffusion is unstructured rather than being a step-like rational process (Baskerville & Pries-Heje, 2001; Van de Ven, Angle & Poole, 1989), and is precipitated by a "shock," that is internal or external to the organization.

According to Rogers (1995), for adoption of an innovation to occur, "adoptees" need to see the advantages arising from such adoption. The innovation needs to be observed and trialled, and must be compatible with "custom and practice." Local initiatives in the Hervey Bay area have attempted to embody these factors (Pease, Rowe & Wright, 2003). Certainly the case study organization has found these bodies to be helpful.

Griffiths, Ronald, Ellen and Pat (1986) argue that organizations must possess certain characteristics for innovation to have a greater chance of success. These cover issues such as resources, including skill, expertise and experience, management support, approach to risk, leadership, motivation and participation. It can be argued that the lack of these characteristics partly explains the slower rate of e-commerce adoption. The case study organization demonstrates the importance of some of these factors in adopting e-commerce successfully, although the full functionality of e-commerce is not utilised.

Innovation Adoption Triggers

The drivers underpinning e-commerce adoption are essentially motivators based on expected benefits from such adoption. Poon and Swatman (1997) identified five criteria that helped to understand e-commerce adoption:

1. New ways of marketing;
2. Stronger relationships with other businesses/partners;
3. Increased ability to reach new customers;
4. Improved customer service; and
5. Reduced communication costs.

Engsbo, Saarinen, Salmi, and Scupola (2001) identified five innovation adoption triggers that can result in the initiation of the adoption process of electronic commerce in SMEs:

1. Strategic opportunity-improve the business performance in the market place;
2. Strategic necessity-developers of the technology pushing/maximising the flow of diffusion (Rothwell, 1992);
3. Forced decision-the use of electronic commerce is required in order to conduct business;
4. Reactive adoption-the electronic commerce technology can solve an immediate problem for the SME; and
5. Just-by-chance-SMEs without any rational process adopt the technology (e.g., government intervention or pilot research projects) (Scupola, 2002).

Of the adoption triggers identified above, just-by-chance was identified as the main reason underlying the take-up of electronic commerce by SMEs generally. Scupola (2002) identified that in the case of the family-driven business, the adoption of electronic commerce is completely casual. It can be argued, that SMEs in regional Australia at least, do not recognize the importance of the emerging economy in their future success and that often the business planning process is ad hoc and does not embrace the "new economy."

Scupola (2002) identified several key factors that inhibit the adoption of electronic commerce by SMEs in Europe and these were broadly categorised into three groupings as shown in Table 2.

Many of these factors indicate ignorance and "fear," and perpetuate the myths of e-commerce. These beliefs and attitudes are posited to be more entrenched in regional areas as awareness of, and exposure to e-commerce, is less than it is in urban areas.

These prevailing attitudes, business practices, and myths cannot be said to apply to the case study organization, the study of which is a useful learning tool to observe a business that goes against entrenched ways of operating that prevail in its local business environment.

Table 2. Key factors that inhibit the diffusion of electronic commerce in SMEs

Perceived Costs
Financial investment
Administrative changes
Timeline for implementation
Organisational Readiness
Lack of education, information and knowledge
Lack of familiarity with using the Internet in an effective and efficient manner
Fear of loss of competitiveness in the market place by the disclosure of product information on the Internet
External Environment
Poor consultation between the IS consultants and the SMEs
Lack of critical mass for the adoption

Education's Role in Diffusion of Technology

Parker and Swatman (1996) sought to answer the research problem, "Why is EDI [electronic data interchange] taking off so much more slowly than anticipated?" They hypothesised that education was a major factor underlying this and set out to empirically test this. Whilst their research relates to EDI, essentially the issues would seem to be similar to the lack of uptake of e-commerce by SMEs. Their research found that more specifically tailored training courses involving simulation was necessary and more effective than general seminar-based approaches which tended not to apply to a particular business or demonstrate how the technology would assist in solving the problems of business.

This is in keeping with the Small Enterprise Telecommunications Centre (SETEL) findings which indicated that, for Australian SMEs at least, there was a lack of realisation of the value and benefits of e-commerce. SETEL contends that the focus needs to be based on four elements: simplification, demystification, leadership (by Government, industry, educators) and promotion of the value proposition to SMEs.

In communicating the virtues of e-commerce, the focus needs to be placed on benefits to the business rather than benefits of technology per se (Brown, 2002, p.18).

CASE STUDY SYNOPSIS

The SME is a family-based business in Hervey Bay, Australia. The SME has an approximate annual turnover of $200,000 and operates on a high profit margin. The firm is a provider of multimedia services and souvenirs targeted at the international tourists who visit a range of destinations within Australia. In recent times the SME has diversified its product range to include online videos, promotional multimedia packages, and multimedia training films. The SME, which effectively has two employees, is an example of a micro-business.

The business' Web site provides sales support and enables customers to communicate with the firm, via e-mail. This is largely used to reorder product, to advise of a problem with a purchase and the like. The site therefore facilitates communication rather than actively sells products. The owner-manager has actively pursued a policy of using eBay as a product sales channel. The use of eBay for sales was seen by the owner to give access to a broader range of global customers using a low-cost and low-risk method without the need to maintain a fully functional e-commerce site along with the site's associated overhead costs, including advertising.

The proprietors use the Internet to assist in the search for new products and suppliers and this has increased the efficiency of their operation with the turnaround time of considering, sourcing and procuring product reduced significantly. Recently the proprietor was able to develop a new multimedia language product, source suppliers and identify niche markets in a period of four days. This responsiveness to market needs was considered to be critical as the product life cycle shortens and the SME increasingly relies on its flexibility and ability to forge relationships with partners to source and distribute product. This has become increasingly important and was a major reason behind the push to the Internet by the case study SME.

The majority of SMEs use the Internet as a basic communication facility (OECD, 1998; Poon & Swatman, 1997). Most SMEs use it as a cost-effective option compared to traditional communication methods such as fax and telephone. Yet the Internet potentially provides a level playing field, reducing the importance of size and asset backing and allowing SMEs to experience growth in profits and market share. However, this is not fully realised for our case study firm, which needs to more completely enter virtual markets by establishing strong relationships in its supply chain.

This increasingly requires engaging with other firms and forming partnerships, as pointed out by Tetteh (1999). Business environment extension may be actioned without acquiring the traditional measures of size, capital resources, large employee base and extensive investment in proprietary networking technology (Tetteh, 1999, p. 2). What is required is an innovative business strategy and an extension of environments through the exploitation of virtual values associated with online infrastructure (Tetteh, 1999, p. 2). This is the challenge for this SME-until such time as this occurs, potential growth over and above what has already been enjoyed is not likely to occur.

Also of significance is the role of external resources and relationships. Strategic partnerships serve to extend the SMEs scope via the formation of business networks (Sherer, 2003). Whilst this is happening at an informal level for the case study SME, in reality it is limited. Such business networks must be operationalised within an overall business strategy (Doz, Prahalad & Hamel, 1990) which must also include an appropriate infrastructure management strategy (Tetteh, 1999, p. 5). This leads to the formation of virtual organizations.

A virtual organization is defined as a set of flexible and short-term, multi-partner relationships among independent economic agents across time zones, mediated by networked information and communication technologies (Tetteh, 1999). Effectively a virtual organi-

zation is a business network in which participants seek to share value through actor-resource-relationship processes.

Within Hervey Bay, the existence of two initiatives, the Fraser Innovation Zone (FIZ) and the Fraser Area Centre for Technology and Open Resource Education Enterprise (FACTOREE) in conjunction with local tertiary institutions, is significant in that they foster discussion, sharing of ideas and provide support. These bodies provide a mechanism that supports the diffusion of innovation (Rogers, 1995) by enabling trialability, communication of relative advantages of adoption, and disseminating information relating to e-commerce. Research needs to be conducted to review the impact of these initiatives upon the rate of take up of e-commerce in the local business community in Hervey Bay (Pease & Rowe, 2003a, 2003b) and the extent to which they facilitate the establishment of networks and alliances amongst SMEs.

Becoming a virtual organization is a distant prospect for the case study SME and it is doubtful whether the proprietors have considered this as an option. The decision to move to a virtual organization requires that the case study SME develop strategies which include "virtuality" in managing the firm's information infrastructure (Davidow & Malone, 1992). This is not likely to happen in the near future as the firm is tied up in operational decision making with little real significance given to more in-depth consideration of strategic issues. It could be stated that the case study SME demonstrates a low level of virtualness having a predominantly physical value chain, and whilst operating internationally, engages in limited co-operative effort with its partners. A more strategic position needs to be adopted for this to change in the future.

CONCLUSION

There are a number of SMEs that are embracing e-commerce in their businesses in the Hervey Bay region. However an overall assessment would be that they are not fully utilising the functionalities available to them. Reasons cited in discussions with various SME proprietors would indicate this was due to lack of awareness and knowledge, lack of know how and especially a fear of the unknown or a fear of technology itself. Predominantly however, the main reason cited is that of a lack of planning or even acknowledgement that potentially e-commerce might assist in the operation of their business.

It is argued that organizations must possess certain characteristics for innovation to have a greater chance of success. These cover issues such as resources, including skill, expertise and experience, management

support, approach to risk, leadership, motivation and participation. It is the authors' contention that in the Hervey Bay region, a number of these characteristics are lacking, partly explaining the slower rate of e-commerce adoption. This contention requires further exploration and research, especially to determine whether this issue, if significant, is important generally for SMEs or is an issue specific to the Hervey Bay region.

Perhaps as suggested by Poon and Jevons (1997) and Golden and Dollinger (1993), inter-organizational co-operation between SMEs could be fostered in the online environment within the Hervey Bay region to maximize benefits to SMEs through the use of the Internet. Organizations such as FIZ and FACTOREE may be appropriate vehicles via which to achieve this co-operation, awareness and dissemination of information so as to build knowledge about effective use of the Web and its potential benefits. There is a need to simulate/demonstrate to actual businesses how e-commerce can be integrated into business and become part of a growth strategy, enabling a shift into the "new economy."

Since the success of e-commerce businesses depends largely on management factors, education is required, not just in terms of e-commerce technology but also in management and marketing practices, to facilitate the integration of e-commerce into business planning. It is evident in the initial investigation of the case study that there is a tendency to focus on operational issues at the expense of business planning or strategic direction. Increased education with respect to strategic vision and realisation of the role e-commerce has in growth, expansion and changes to business practices, is critical in the acceptance of e-commerce by SMEs.

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KEY TERMS

Diffusion of Innovation: The spread of abstract ideas and concepts, technical information and actual practices within a social system. In the context of small and medium enterprises (SMEs): flow or movement of innovation from a source to an adopter, typically via communication and influence.

E-Commerce (Electronic Commerce): The process of buying, selling or exchanging products, services and information using computer networks.

Network: A system which links together equipment, organizations or people. In the context of small and medium enterprises (SMEs): a coming together of firms, either formally or informally, to share ideas and pass on information to other "members."

New Economy: Encompasses the many changes that are reshaping the economy in which the firm/business operates. These include globalisation, technological advances, structural change and entrepreneurship, inter alia.

Strategic Alliances: Agreements to share costs, risks and benefits emanating from business opportunities that arise. Such agreements can take many forms – e.g., joint ventures or long term contracts.

Supply Chain: The complex interconnections and relationships between all organizations involved in the progression of raw materials to the delivery of goods and services to a customer. The term supply chain comes from the concept of how the partnering organizations are linked together.

Virtual Organization: An organization which relies upon electronic communication between its participants. In the context of small and medium enterprises (SMEs): business structure based upon electronic communication between partners; often characterised by low departmentalisation and intensive use of outsourcing.

E–Commerce and Small Tourism Firms

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INTRODUCTION

Today's networked economy is a strategic combination of many factors, with electronic platforms and relationships underpinning competitive advantage. Enabled and driven by information and communication technologies (ICT) and connectivity, the networked economy is challenging the fundamental bases of established government frameworks, conventional business practices, and traditional marketing disciplines. To achieve business success in this techno-economic paradigm requires new ways of thinking for all.

This article examines regional development trends, such as the growing importance of connectivity, electronic-commerce (e-commerce), and industry networks for global competitive advantage. Within that context, it discusses issues facing small tourism firms in becoming part of the networked economy.

REGIONAL NETWORKS

A consistent pattern in today's economic business process is collaboration between firms, whereby emphasis is placed on networking, knowledge sharing, and cooperation rather than competition (Asheim, 2001). The adoption and diffusion of ICT and the Internet are integral components in today's business processes, as connectivity has increased our ability to connect and communicate with others, regardless of whether they are located locally, regionally, nationally, or across the globe.

Research indicates that network building is not only a major new source of competitive advantage for any company, but also a crucial asset to business survival and an essential global and, indeed, regional development requirement (Porter, 1998). Because the processes of ICT-based information seeking, information distribution, and knowledge sharing are interactive, it is believed that a firm's information channels or interpersonal networks play an important role.

In recent times, regional development policy has undergone a paradigm shift from an exogenous or external focus to an endogenous or internal and relational network one (Storper, 1997). Networking, community building, and learning are portrayed as pivotal linkages for regional growth, whereby policy makers concerned with the performance of regional economies are seeking to foster a networked community culture (Asheim, 2001). In geographic terms, networks can operate on international, national, regional, and local levels. Examples of this network-building trend may be found internationally on the European Commission and the APEC action agendas (APEC, 2001). The trend is also reflected in Australian regional development policy, which, in taking its cues from global trends in regional development, portrays connectivity, networking, industry clustering, regional specialization, and capacity building as pivotal for regional growth (ALGA, 2002).

As such, network formation is not a novel or emerging concept but rather a recycled notion caught up in a new policy wave. Theoretical discussions on interfirm organization can be found as far back as 1960 (Philips, 1960), although it would take several decades more until Miles and Snow (1992) identified a significant movement toward the so-called network form. Since then, myriad network structures and traits have been discussed in the literature, including firm interdependence, trust between network partners, pitfalls of network alliances, and issues surrounding change. The latter is of particular relevance in these rapidly changing times. Business networks are subject to external changes, such as a transformation in the economic and technological climate, and internal changes, such as competition and issues of power and trust (Håkansson, 1995).

Connectivity and the Internet have added new dimensions to the concept of networked firms. The advent of connectivity has boosted conventional reasons for interfirm networking, as the technology-enabled landscape provides the capacity for firms to collaborate with former competitors and potentially achieve "competitive co-evolution, enhanced by digital platform features" (Ordanini, 2001, p. 282). The concept of clustering, another form of network formation, has gained new prominence, as it can help create critical mass and facilitate the knowledge-based infrastructure needed for competitive advantage. Porter (1998) discusses competitive advantage as being created and sustained through a highly localized process and ascribes enduring competitive advantage in a global economy to local knowledge, relationships, and motivation that cannot be duplicated by global partnering. Thus, as a result of the networked economy, it may be said that organizational change can be expected

throughout regions and across a number of industries, and especially in information-based industries such as the tourism industry.

TOURISM AND TECHNOLOGY

Being among the two largest, most rapidly growing, and most dynamic industries, tourism and technology have become inextricably linked. Together, they are changing the way society operates (Werthner & Klein, 1999). The tourism industry has always relied heavily on information. In fact, until a tourist gets to his or her chosen destination, tourism *is* information rather than a physical product. While tourism services are produced and consumed in a physical world set in a regional or local context, purchase of a tourism product is generally based on information received through direct or intermediary market channels, prior knowledge, word of mouth, and perceptions of trust and service quality. As the nature of the tourism product is information-based, it is a search product that is evaluated by perusing product-related information. Being dependent on effective information flows makes the tourism product a complex one, as it is "…almost entirely dependent upon representations (such as pictures in brochures) and descriptions to help consumers make a purchase decision" (Laubenheimer, 1999, p. 279).

Tourism intermediaries typically fulfill functions such as presorting and structuring tourism product information, providing a place for the supply and demand sides to meet, and reducing uncertainty. Travel agents have traditionally been high-profile intermediaries between travel suppliers and consumers, selling the tourism product, for which they derive a sales commission, to customers. Apart from their customer service role, a travel agent's product knowledge and expertise is the value added for the customer. Destination marketing organizations, such as regional and local tourist information centers, also perform an intermediary (booking) role, most often between consumers and tourism small to medium-size enterprises (SMEs) (Wynne, 2001).

Now information technology and the Internet enter the picture. The Internet has the ability to provide a highly suitable and major new market channel for tourist products, because it can display information and pictures. The travel and tourism sector to a large degree depends on business-to-consumer (B2C) e-commerce activity. The Internet can create a direct link between a worldwide supplier community and equally dispersed consumers. Speed is also crucial in the travel industry, and the Internet can provide an instant confirmation response to an inquiry such as flight or room availability. The influence of ICT on tourism product perusal and purchase is evident in the proliferation of travel/tourism sites on the Web (Bernstein, 1999). A search engine query on travel and tourism will return an incredible 15 million results, which includes information on anything from outback tours to deep sea adventures to bed-and-breakfast stays around the globe. To date, the sale of online airline tickets constitutes the largest part of e-commerce-related travel business. In North America alone, travel purchases before 2000 accounted for US$4 billion in sales, with forecasts for 2003 ranging up to US$29 billion (Pappas, 2001).

With increasing ICT literacy of prospective customers, consumer expectation of easy access to tourism product is rising. Such consumer expectations are likely to increase pressure on product providers to either offer instantaneous product information satisfaction or lose potential customers (Buhalis & Main, 1998). The emergence of electronic markets and the increased ICT literacy of prospective customers, who now have the opportunity to bypass intermediaries in the travel value chain by booking directly on the Web, have kindled questions about the necessity and ability of small tourism firms to become part of the networked economy.

REGIONAL TOURISM SMEs

In many parts of the world, SMEs and micro tourism enterprises make a substantial contribution to regional economies. In this context, tourism SMEs are an important instrument for raising the profile of a region. At the same time, the requirements of the globalized economy raise the bar for tourism SMEs in all regions, with expectations toward a high capacity for ICT innovation, even on a relatively small scale (ALGA, 2002).

While connectivity has the potential to increase regionally-based tourism SMEs' visibility in the marketplace, small tourism enterprises have been facing difficulties embracing ICT and competing with their larger counterparts. Small tourism firms, much like other small firms, often lack the time, skills, and resources needed to implement ICT (Buhalis & Main, 1998). Micro and small tourism enterprises generally consider themselves outside the tourism industry, despite the fact that most of their customers are tourists (Evans, 2001). Their size being their main disadvantage, tourism SMEs tend to be overdependent on intermediaries for product marketing and distribution and, therefore, have limited bargaining power in the distribution channel (Werthner & Klein, 1999). Other barriers may include technology itself, where the lifestyle choice of owner-operators often entails a negative attitude toward ICT (Evans, 2001). Besides, many tourism SMEs are located in peripheral regions where the ICT infrastructure, especially broadband, can still be inadequate or prohibitively expensive due to limited demand

(Anckar & Walden, 2001). In some cases, this leads to a perceived lack of value of ICT and the Internet.

A New Zealand study of micro tourism firms identified the education and professional background of owner-operators to be significant barriers (Ateljevic, 1999), pointing to a widespread consensus that industry preparedness in terms of training falls well short of the requirements to operate within a now ICT-driven sector (Danielle, 1999). Presenting the results of a three-year study on the usage of and plans for ICT training in a fragmented and SME-dominated European tourism sector, Evans et al. (2001) note that small tourism firms may well remain lost in the electronic marketplace, unless they are assisted in the usage of ICT tools and acquire the skills needed to participate in the digital economy.

Being small businesses, tourism SMEs have rather limited marketing means and, despite the information-intense nature of the tourism product, are not necessarily up to the task of marketing themselves online. As individual enterprises with limited marketing budgets, most small firms fail to focus on marketing planning and market intelligence. Preoccupied with the operational running of their business, smaller operators have tended to approach their markets "…less formally and more intuitively from their detailed, close contact with their guests" (Main, 1999). To make matters worse, a micro tourism Web site is easily overshadowed by the plethora of mega tourism Web sites, such as Travelocity and Expedia, currently available on the Internet. To summarize, due to their nature and scale, small tourism firms lack the advantages of larger tourism enterprises, such as resources, know-how, and access to global distribution systems and other network support systems. At the same time, there is increasing pressure on small firms to offer Web-based product information.

REGIONAL TOURISM NETWORKS

Although ICT appears to threaten the existence of small tourism firms without resources, know-how, and access to distribution channels, regional network formation may provide a solution for small tourism firms.

The interrelationship between tourism and technology is not a recent phenomenon; it dates back to the early days of computing and the impact of post-1960s mass travel. To date, however, travel industry networks that pursue Web-enabled capabilities have been largely driven by the airline industry seeking to extend its global reach through strategically aligned partnerships, global booking and distribution systems, and cost-saving synergies in services such as baggage handling, catering, engineering, and maintenance (Pappas, 2001). Thus, the Internet provides big players with far-reaching business-to-consumer (B2C) as

well as business-to-business (B2B) opportunities to enhance and develop specialized relationships with their customer base. However, as a result of the networked economy, organizational changes are now expected to affect the entire tourism industry, which is predominantly made up of small enterprises.

Almost a decade ago, in addressing tourism and technology, Poon (1993) stressed that to avoid isolation, achieve economies of scale, and maximize destination benefits, there would be no place in the future for the stand-alone tourism SMEs; and that networking would allow small tourism firms to pool their resources, reduce operating costs, increase know-how, and formulate strategic marketing plans. Research further suggests that small tourism enterprises form a natural amalgam, because the fortunes of the destination and the firms are closely intertwined. Buhalis and Cooper (1998) believe that tourism SMEs tend to cooperate rather than compete by formulating value-added networks of product and service delivery (e.g., by referring customers to each other), thus enhancing tourist satisfaction. Anckar and Walden (2001) similarly advocate that a network or information technology infrastructure is not only useful but is, indeed, essential in bringing small tourism firms and cyber customers together, as well as increasing the willingness of cyber customers to purchase tourism products from smaller regional suppliers. In addition, mapping and understanding the processes that take place in existing tourism networks has the potential to speed up technology adoption and create effective collaborative network outcomes (Braun, 2004).

Cooperative marketing research has long confirmed that networking in the form of cooperative marketing can add value to a destination (Palmer & McCole, 2000). Traditionally, such cooperation has been used in the production of joint marketing brochures and shared stands at trade shows. The advent of the Internet and related regional development trends offer expanded opportunities for cooperative marketing. Tourism operators on both the macro (destination) and micro (individual tourism SMEs) levels are starting to see the potential benefits of using Web technologies for cooperative marketing and transaction purposes (Main, 2002). In the wake of information technology and new regional network initiatives, cooperative marketing Web sites are proliferating (Tourism Victoria, 2002).

Interesting cooperative marketing and e-commerce opportunities notwithstanding, tourism SMEs' participation in networks is far from guaranteed. Joining a network constitutes a considerable leap for small tourism firms. Barriers to entering networks have been put down to cultural factors on the one hand and lack of resources (time, staff, opportunity) on the other. Evans (1999) particularly singles out aversion to joining groups and

attending training sessions and meetings, which "may be antithetic to the stress that owner-managers place on autonomy and independence—the main reason they went into business on their own in the first place" (Evans, 1999, p. 380). Small firms tend to limit their external contacts to compulsory contacts, e.g., local government and tax agencies and direct support actors and agencies, e.g., customers, accountants, and banks.

A research project undertaken with small tourism firms in North London showed that the greatest interest in networking came from those businesses that had the strongest links to the local economy (Evans, 1999). The development of a shared destination Web site proved to be attractive to local tourism operators in terms of joint marketing and securing new business. However, the project also highlighted the firms' relatively underdeveloped knowledge of ICT and a varying degree of reluctance within the sector in terms of joining a network. Although notable research into tourism-specific cooperative use of the Internet as a marketing tool and e-commerce remains in its infancy (Beckendorff, 2000), to date the greatest interest in using ICT networks in the tourism sector has been to develop joint online marketing initiatives, indicating that many tourism SMEs have yet to embrace Web-based e-commerce processes. Initial value for tourism SMEs lies in the debunking of ICT jargon, cutting connectivity cost, gaining online visibility, gaining trust in network structures, and obtaining e-commerce skills through linkages with local partners. Continued incentives and support will help tourism SMEs get comfortable and take mental, physical, and virtual possession of a shared ICT domain (Braun, 2002).

Tourism networks, like all networks, should be seen as complex and dynamic organisms with ever-changing actors and external economic and technological influences. ICT-based network formation involves an intensive learning process for every actor involved in the network. This requires strong social ties within the network, fluid communications flows, strong leadership, and commitment to the network. In certain instances, network formation and small business collaboration will need to be fostered through the offering of incentives and training. An appropriate balance also needs to be struck between autonomy and competition in evolving small tourism firms from an individualistic business to a network culture. By drawing on a broader skill base through the forging of new partnerships between regional e-commerce experts and marketing bodies, issues such as product and market reach can be addressed. Similarly, inclusion of small firms in global marketing and distribution systems may help advance tourism regions and, thus, small tourism firms into the global marketplace and help forge new destination management partnerships.

CONCLUSION

Today, ICT and the Internet enable tourism SMEs and tourism networks such as regional destination marketing organizations (DMO) to better cope with increased information flows, getting the marketing message out to the public, and selling their product online through e-commerce.

The Internet has the ability to provide a highly suitable and major new market channel for tourist product, because it can create a direct link between regional tourism SMEs and worldwide consumers. By using the Internet as an online network and cooperative market channel, tourism destinations, marketing organizations, and individual tourism SMEs in regions all over the world have an opportunity to contribute to regional development and keep up with a now predominantly ICT-based industry.

For many small tourism firms, joining an ICT-based network and embracing e-commerce will entail radical new ways of business thinking, which will take time. As Gretzel et al. (2000) have pointed out, success in the new information economy is more about changes in approach than about the technology itself.

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KEY TERMS

APEC: Asia Pacific Economic Cooperation.

Connectivity: The ability to link to the Internet via a computer.

DMO: Destination marketing organization.

ICT: Information and communication technologies. The technology and tools used to transfer information and speed up communication processes.

Intermediary: Person or organization performing a (booking) role between consumers and business.

Market Channel: A publicly accessible means such as a newspaper, magazine, trade show, radio, billboards, television, or the Internet, used to advertise and market products.

SMEs: Small and medium-size enterprises. Refers to enterprises with a specific number of staff. A small-size enterprise generally refers to firms with less than 20 employees.

Web-Enabled: Business systems that are supported by Internet technologies.

E–Commerce Challenges for Caribbean Businesses

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INTRODUCTION

E-Commerce in the Caribbean

The global environment of e-commerce is revolutionizing business practices and reshaping traditional business transactions over "computer-mediated networks" (Schmitz et al., 2001). Although fairly well-established in developed countries, e-commerce in Caribbean developing countries remains in the early stages of development. Put it simply, given the peculiar set of social, economic, technical, and legal issues affecting these economies, e-commerce is viewed as a complex but challenging business issue. Admittedly, both local and regional businesses have realized that e-commerce can "accelerate economic development" (Schmitz et al., 2001) in their respective economies. As a result, they have hastily attempted to "leap-frog" into the global networked economy. Yet, several challenges remain to be faced by these businesses. This article is concerned specifically with Internet-based Business-to-Consumer (B2C) e-commerce, unlike other e-commerce forms, such as Business-to-Business (B2B) and Business-to-Government (B2G).

Although little academic literature has been undertaken to explore e-commerce in Caribbean countries, and among Caribbean countries, a 2002 country survey sought to investigate some of these challenges. Trinidad and Tobago was selected having attained the highest rank (46th) in the Caribbean Region in the Global Report on *Readiness for the Networked World* (Harvard, 2002). The survey sought to identify the kind of barriers experienced by large private-sector organisations in expanding their commercial activity in a networked economy.

The chart below, Figure 1, shows the ten cited barriers, in decreasing importance, that affect the emergence of e-commerce. The barriers were ranked by the percentage of respondents who stated it reflected one of the most important barriers. In the chart, more than 50 percent of the respondent companies attributed the main obstacles to e-commerce development as access to the Internet, financial costs, security of e-transactions, and organisational culture (Escalante, 2002).

Figure 1. The 10 cited barriers, in decreasing importance, that affect the emergence of e-commerce (Source: Escalante, 2002)
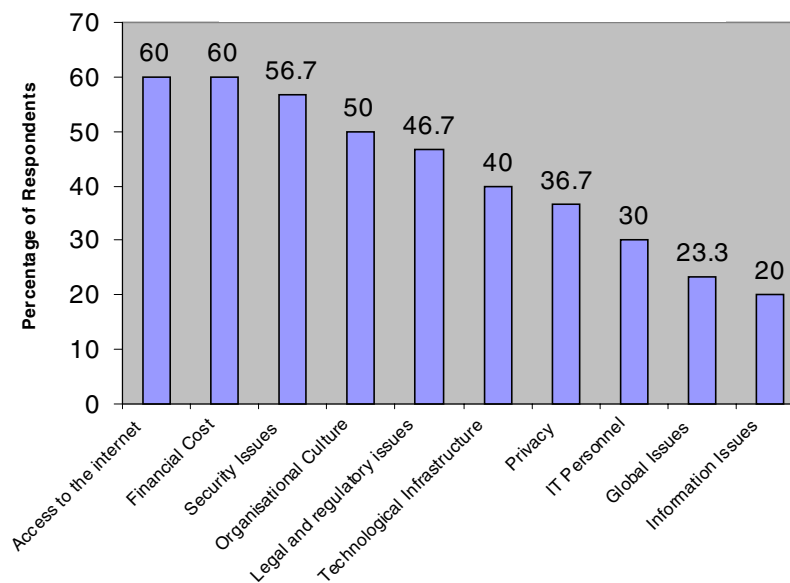
Table 1. Main reason for each ranked barrier

Ranked Barrier	Main Reason
Access to the Internet	Internet/Web being too slow
Financial cost	Higher (unexpected) technology expenditure
Security of e-payment transactions	Deception/risk of fraud and loss
Organisational culture	Non-conduciveness to e-commerce
Legal and regulatory issues	Uncertain and inconsistent legal environment
Technological infrastructure	High technology maintenance cost
Privacy	Concerns about confidentiality
IT personnel	Training cost/high salaries
Global issues	High degree of complexity of e-commerce
Information issues	Inability to add value to information

Respondents were also asked to identify the main reason for each of the ranked barriers. The results are given in Table 1.

The Caribbean region is frequently cited as a region of huge potential growth for e-commerce. To achieve this, government input is required for the legal and policy changes that will provide a secure but technically-oriented environment for e-commerce to flourish in the Region. Unfortunately, apart from the rhetoric "to actively engage in e-commerce," there is a quiet reluctance by regional governments, which can prove to be a hindrance to e-commerce development. This is because Internet technologies are bypassing governments whose power resolve around the control of information. Hence mechanisms must be found to overcome these barriers.

Issues Affecting E-Commerce Development

For Caribbean countries with little or no theoretical development on how to predict or even describe the e-commerce phenomena in the Region, the *UNCTAD E-commerce Report 2003* identifies two main issues concerning e-commerce development. These issues are:

1. The **intensity** of utilising information and communications technologies (ICT) within a country, and the extent to which e-commerce activities are undertaken.
2. The **readiness** of a people, business, infrastructure and its economy to undertake e-commerce activities.

Firstly, Internet technologies originating in the developed countries are utilised far more cost-effectively in development of e-commerce than in developing countries, such as the Caribbean. Along with the requisite telecommunications infrastructure, access to the Internet has created the environment whereby virtually every major business is trying to position itself competitively, and create new value through online businesses. No longer is geographic distance an obstacle to access, or for communicating efficiently and effectively with business associates and customers globally.

Although "access to the Internet" usually refers to the presence of telephone lines, computers, and Internet Service Providers, "economic access" is also important. Studies have shown the societal changes resulting from Internet technologies, while pervasive in developed countries, also have a profound effect in developing countries (Wiederhold, 1999). Divisions along the lines of income, education, race, and gender, factor into creating a distinction between groups in a society. These divisions can be found in the societies of both developed as well as developing countries. Seemingly, this has led observers to comment that there is a greater "digital-divide" within countries than between countries.

Secondly, e-commerce has become more a business issue than a technology issue since the development and maturing of the Region's social, economic and technical infrastructures have coincided with the advent of globalization and trade liberalisation. Currently, "approximately 85% of the world's e-commerce Web sites are US-based, with Western Europe and Asia making up almost all of the rest" (Tangkitvanich, 2001). These countries have "high levels of development measured by income per capita having the widest Internet penetration" (Tangkitvanich, 2001). With low Internet penetration rates in the region, liberalisation may or may not necessarily be appropriate for the region's e-commerce development,

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particularly since Caribbean countries are still at an early stage in their e-commerce development.

Using the 2002 survey results, this article seeks to examine both the economic and non-economic challenges faced by Caribbean businesses, in the new global economy. Although not frequently dealt with in the literature, non-economic barriers hold special interest to the Caribbean business community as they are in danger of being marginalised in this new economy. Because of the complexity involved in Caribbean e-commerce, the article also suggests that Caribbean governments embark on a course of action to fully develop an information infrastructure supported by relevant legislation on e-commerce, including digital signatures, and administered by knowledge and data workers. This can only redound to the overall e-commerce development in the Caribbean Region.

REVIEW OF 2002 E-COMMERCE SURVEY

The structure of the 2002 survey made for easy completion by respondents, hence minimizing non-response. Respondents indicated on a scale of one to ten, to what extent they considered each of the barriers to be an obstacle to the emergence of e-commerce. For each barrier listed, respondents ranked on a scale of one to three, to what extent they considered each of the statements to be a cause of the barrier. Completion time was estimated at less than five minutes.

The survey was posted to 75 fairly large private-sector organisations throughout Trinidad and Tobago. These organisations were distributed throughout 12 sectors of the economy. These were: Banking/Finance/Insurance, Manufacturing, Construction, Agriculture/Environmental, Services/Consultancy, Tourism, IT/Telecommunications, Education, Energy, Travel/ Transportation, Media Publishing, and Healthcare. While not a random

sample, 30 usable responses were received, representing 40 percent of the total sample. Figure 1 illustrates the industry sector and percentage of respondents. These respondents represent a very wide spectrum of interests, backgrounds, experiences, and expertise on e-commerce.

These organisations also highlighted their various motivations for using e-commerce (Figure 2). More than 50 percent of the companies stated that their motivation for using e-commerce was to improve service quality, expand their market geographically and expand relations with their customers.

A major finding of the study was the realization by businesses that the exploitation of ICT was necessary to increase competitiveness in the economy. By extension, the survey's findings can be applied to the wider Caribbean. Chaitoo (2000) mentions that e-commerce in the region can provide "significant benefits in traditional sectors such as tourism, music and entertainment and also opens up an almost limitless range of possibilities for increasing exports in nontraditional exports" (p. 7).

PRESENT ECONOMIC CHALLENGES

Telecommunications and High Economic Costs

Although the Caribbean Region is still evolving toward a liberalised and competitive environment for telecommunications, it is beginning to benefit from recent private investments in the physical telecommunications infrastructure. The increasing use of IT by the Caribbean business community also facilitates an e-commerce culture being adopted. However, in varying degrees, all Caribbean countries depend on the more advanced countries when it comes to the transfer of information and communications technology (ICT).

Figure 2. Company composition by industry sector
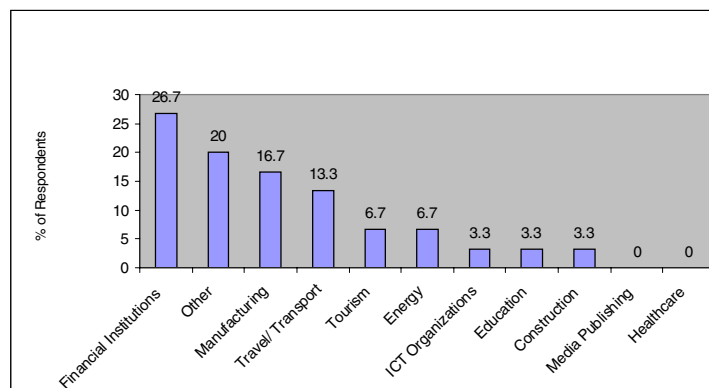
Figure 3. Motivations for using e-commerce
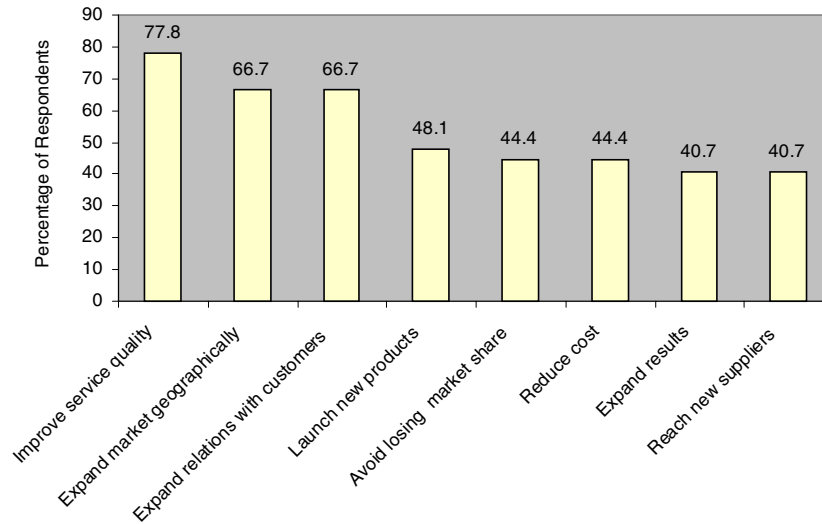
The British Transnational Company (TNC), Cable and Wireless, has had a long history in the region as the dominant telecommunication provider. Through its investments in the region's telecommunications network, this monopoly TNC can also affect the rate at which Internet technology is transferred to the Caribbean countries. For instance, Jankie Glass, General Manager of Karib Cable, states that global consumers and businesses have "easy access to cheaper, newer and faster technology to access the Internet, and for basic services." Yet, she contends that the vast majority of the Caribbean is still stuck with 56K dial-up modern technology (New Executive Times, 2002). Glass (2002) also mentions that for a region as small as the Caribbean, the general population should not be paying long distance rates to call between the islands. However, as a major telecommunications investor, Cable and Wireless has injected substantial funding over the recent years, aimed at increasing the network bandwidth for increased information usage.

This degree of control impacts negatively on business and economic development as high communication costs affect competitiveness and GNP growth in these countries. Another consequence is that there is no significant increase in productivity usually associated as a major e-commerce benefit.

Foreign Exchange in the New Economy

Obtaining foreign currency for the payment of traded goods has always been viewed as a long-standing problem for developing economies. With the evolution toward a new global economy, new "non-cash technologies"

(Tumin, 2002) have been advanced. However, even when used online, they are still "principally linked to slow-moving book-entry clearing and settlement systems" (Tumin, 2002). Hence the foreign currency problem still persists.

In the developing countries, foreign currency finds its greatest demand in the business sector. Hypothetically, should a Caribbean developing country relax foreign exchange restrictions in order to facilitate the business sector in purchasing foreign goods via the Internet, it risks acquiring international liquidity problems. This is not the case for online businesses in developed countries where "e-trading" is primarily domestic in nature. For the business sector, a sharp decline in foreign exchange will undoubtedly have downward spiral effects in production, employment, and profits. Governments of developing countries are aware of this and, despite the rhetoric to actively engage in e-commerce, they can become reluctant hindrances to e-commerce.

Import Duties and Taxes

As e-commerce becomes "even more tightly intertwined with business and distribution models" (DelBianco and Tavilla, 2002), B2C transactions eliminate the need for import duties and taxes. This results in a cheaper product to the consumer. However, many governments view import duties and taxes as a vital source of government revenue. Viewed as a traditional intermediary governments often impose legacy regulations and restrictions, as well as "new, discriminatory limits designed to protect off-line interests" (DelBianco & Tavilla, 2002). For Carib-

bean developing countries with small domestic markets, any expansion thrust by local businesses to the large markets of developed countries must be export oriented. Taxes and import duties help serve as a form of protection for local producers. Hence, developing economies tend to be reluctant in rolling back these import duties and taxes.

Yet, developed countries also place restrictions on the exports of businesses in developing countries. Previously, under the General Agreement of Trade and Tariffs (GATT), tariff levels were lowered in favour of developing countries. However, developed countries have now placed "greater reliance on the use of Non-tariff Mechanisms (NTMs)" (Clark, 1999). These NTMs can either focus on quantitative resections (QR) or operate through price and cost mechanisms. Clark (1999) further shows that the use of these mechanisms clearly discriminates against the exports of the developing countries in favour to the exports of other developed countries.

PRESENT NON-ECONOMIC CHALLENGES

Security and Cultural Perception

Although Internet technologies are available for secure e-commerce transactions, many consumers in the developed countries are still concerned about the rise and fall of the technology "bubble" which led to an economic crash in the late-1990s. In hindsight, this crash had everything to do with the idea of "trust." Consumers are therefore wary of these technologies with respect to online payment, privacy, and consumer service. Consumers perceive that deception and risk of fraud and loss are too prevalent with conducting e-commerce transactions.

In both developed and developing countries, Egger (2000) indicates that this "difficulty of use and lack of trust . . . constitutes a real psychological barrier to e-commerce." This psychological uneasiness could represent a culture not yet familiar with secure Internet technologies, but who are willing to "log on" to Internet Web sites to "access information, communicate, and download software." For businesses, this presents a major challenge to implementing a sustainable e-commerce environment in the region. However, regional governments have a role to play in promoting confidence, and establishing trust without corruption, as businesses and consumers engage in e-commerce.

Legal Infrastructure for Digital Signatures

For e-commerce to be successful, businesses and consumers must be able to transmit and receive electronic documents in an environment of trust. Since these "e-documents" take the place of signed paper records, new approaches to the use of signatures have been developed. The 1990 report arising from the United Nations Commission on International Trade Law (UNCITRAL) showed that handwritten signatures can no longer meet business or consumer needs.

Electronic signatures are an alternative to traditional signatures. Being more versatile than handwritten signatures, they provide a way to electronically "*sign*" digital documents. They must also address all the functions of traditional signatures, namely authenticating, verifying, non-repudiability, and message integrity (Winn, 2001). Once these functions are satisfied, trust can be established for both the signature and the document.

Many developed countries have enacted e-commerce legislation to guarantee that a valid contract has been entered into between the parties of any e-commerce transaction. Yet, in Caribbean nations, there is a notable absence of such legislation on electronic transactions, although there is some legislative focus regarding the development of effective regulatory regimes both for e-commerce and for e-government. Existing legislation is however inappropriate in assessing the validity of electronic documents, and furthermore, becomes quite complicated when dealing with electronic contracts for online business transactions. This puts Caribbean businesses at a greater risk than businesses in developed countries when engaging in e-commerce transactions.

Organisational Culture and IT Personnel

Most organisations have yet to become responsive to e-commerce. This constitutes another barrier to e-commerce. Many organisations (43.3% of all respondents, see Figure 3) highlighted the high financial cost associated with IT training and/or for salaries of IT qualified personnel. These persons were responsible for developing and maintaining e-commerce Web sites. This has a direct bearing on the readiness of the people, infrastructure and the economy of the region to undertake e-commerce activities, as outlined in the UNCTAD Report.

However, the 2002 survey also indicated that the financial sector strongly adopted IT and were more likely to engage in some degree of e-commerce than any other sector. These organisations also recognised the value and worth of having qualified IT personnel and compensated these persons appropriately.

IN LIEU OF A CONCLUSION: SOME RECOMMENDATIONS

E-commerce in the Caribbean is indeed a complex business issue. In the absence of serious academic literature on e-commerce in the Caribbean, what literature that does exist, is unable to predict or even adequately describe what is happening in the Caribbean Region. UNCTAD documents, for example, indicate that the Region's economy is not quite ready to undertake e-commerce activities. Admittedly, Caribbean businesses have recognised that technology penetration for e-commerce is not as widespread as in developed countries. Hence the digital divide can negatively affect GNP growth in their developing countries. Not surprisingly, the 2002 country survey results indicated that much more activity needs to be accomplished before e-commerce activity can truly flourish in the Caribbean Region.

In lieu of a conclusion, three recommendations are put forward. Firstly, a well-defined information infrastructure needs to be developed, supported by relevant legislation as well as regulation (subsequent to the enactment of law). This infrastructure must promote the development, expansion and operation of telecommunication networks and services. This can only be achieved if the governments in the Caribbean Region resolve to liberalise and regulate the telecommunications industry. Such attempts will invite competition as developing countries like the Caribbean represent an emerging market for technology goods and services, particularly in the information services industry.

Secondly, for this information framework to function, trust and confidence must be built among all contracting parties regarding the nature of the products and services of the transactions. This can be achieved through using digital signatures as a secure technology for e-commerce transactions. Although this technology is secure and most people want it, they must overcome the initial, but negative, perception of its technological weakness. Governments can help alleviate this perception by intervening and creating a public awareness of the uses of these technologies. This can be achieved by governments being proactive in developing and implementing national ICT strategies for e-commerce with private sector assistance. Perhaps Caribbean govern-

ments should consider viewing trust and confidence as a public good in the e-commerce environment.

Thirdly, Caribbean businesses need to come to terms with the "culture of inefficiency" that pervades the work environment, if they wish to compete in new global e-markets. This requires the support from the regional governments. Given the present trends toward e-commerce, and indications of increased internet penetration, public policies are beginning to support the notion of an information society comprising efficient, yet effective, knowledge and data workers.

In the final analysis, the complexities involved in moving toward an e-commerce environment in the region require a more in-depth analysis of e-commerce scenarios by both government and business entities in each country. Regionally, these national entities need to embrace the idea of regional cooperation and policy discussion on similar e-commerce challenges affecting their economies. The Caribbean business community is therefore geared to play a pivotal role in realising the potential benefits that can accrue from e-commerce in the region.

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KEY TERMS

B2C E-Commerce: B2C e-commerce involves transactions where businesses are in touch with numerous potential Internet consumers (e-consumers) at the individual, retail level, and where these consumers are able to seek goods and services over computer-mediated networks as well as the Internet (adapted from Schmitz et al., 2001).

Caribbean Region: Unlike the European continent, the Caribbean Region is an archipelago. It consists of a chain of islands separated by water, but which are not separated by great distances. This has forged a somewhat "loose" Caribbean community since collective action is effectively constrained. The region does not possess the typical Western cultural foundations dating back thousands of years.

Developing Countries: The group of countries generally accepted as containing the poorer nations of the world. It is often used interchangeably with the term "third world," i.e., belonging neither to the first world (developed countries) nor the second world (former countries with command economies).

Electronic Signatures: This term refers to all electronic authentication technologies and methods of "signing" a digital document that serve the same purpose as manual signatures.

Internet: A global system of interconnected networks that allows for data transmission between myriad computers. The Internet can usually be accessed using Internet Service Providers.

Internet Service Provider (ISP): An organisation that provides Internet access to individuals or other organisations.

Non-Reputability: A signature may indicate that the signer has agreed to be bound by the terms set out in the document or that he has approved the transaction that it reflects.

World Wide Web: A popular application of the Internet sometime known as the "the Web." The WWW is a software tool that uses hypertext links to allow computers to easily retrieve and add information from different computer sources.

E-Commerce in the Sub-Saharan Africa

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INTRODUCTION

Business firms continue to explore innovative ways of conducting business for many reasons. For electronic commerce (e-commerce) the reasons may range from the maximization of profits through an enlarged clientele to the reduction of operating costs. As the Internet continues to experience phenomenal growth in the sub-Saharan Africa, opportunities are being seized by various players to fully exploit the 'Net' as a reliable tool for communication, marketing and commerce. Through the Internet people are able to exchange information, even far afield, at reasonable costs, businesses are able to capture target markets for their products and services, and online shopping is no longer a pipe dream. The Internet therefore is one tool that has played and continues to play quite a pivotal role in the enabling of electronic commerce and this is due to the following unparalleled benefits it offers to the e-commerce environment:

- The Internet provides a two-way digital communication with tremendous speed. This translates into instant feedback from either party.
- The Internet allows multimedia propagation of information (e.g., text, video and sound).
- The use of hypertext documents on the World Wide Web makes it easier to place more in-depth information and a wider variety of products' information on a small space (i.e., the Web page).
- The Internet is attractive (Ward et al., 1999).
- The Internet allows for around-the-clock transactions.
- Unlimited outreach (audience).
- Online payment.
- It is easier to manage the products' databases.

The benefits of the Internet to the electronic business environment extolled above make it an integral part of e-commerce. For business firms in the sub-Saharan Africa, getting connected to the Internet is a *sine qua non* in their quest to rope in a larger clientele so that they can compete favorably in the highly sophisticated marketplace. The Internet, which continues to grow at breakneck pace, is a valuable point of reaching out (marketing) in this case. The Internet has the potential to make a business visible in no time and distance is an irrelevant factor. Little wonder, e-commerce, though perceived as a new phenomenon in the sub-Saharan Africa region, is experiencing unexpected growth. The reasons for its worldwide adoption are many and entrepreneurs in the developing countries need not be left out.

The ongoing connectivity of the disadvantaged regions to the information superhighway will most likely increase the volume of electronic business in the foreseeable future. According to a snapshot study by Dataquest (a unit of Gartner Group, Inc.), electronic commerce accounted for $31.2 billion of the world's business transactions in 1999 alone, up from $11.2 billion in 1998. The rise in the volume of transactions represents an approximate three-fold increase. The study further projected an increase in the volume of electronic transactions in the years leading up to 2003.

In a related study conducted by the Forrester Research late in 1998, it was projected that an explosion in the sales of consumer goods on the 'Net' from $7.8 billion in 1998 to an estimated $108 billion in 2003 was expected, signifying an increase of ten times over.

The projected rise in e-commerce indicated by these two studies may be attributed to the ongoing connectivity of the unwired or loosely wired regions of the world and the strengthening of weaker economies.

The benefits of e-commerce for micro-enterprises, tourism and health provide a tantalizing goal for many situations in sub-Saharan Africa. However, the situation for establishment of e-commerce is inequitable across the region and in fact could widen the existing substantial socio-economic divide. Hence, there is a need to examine ways to give many in sub-Saharan Africa access to any potential benefits that may be available to increase opportunities for increasing self-reliance.

This article discusses the challenges and controversies surrounding e-commerce in much of the sub-Saharan Africa.

INTERNET AND E-COMMERCE IN THE SUB-SAHARAN AFRICA: CHALLENGES AND CONTROVERSIES

Although e-commerce has been looked at in a positive light, it is yet to establish itself firmly in the sub-Saharan Africa. Many sub-Saharan Africa countries are

still struggling with poverty and many other embedded socio-economic ills. As such access to the Internet in the sub-Saharan Africa ranges from stagnant to impressive across individual countries. Just like many other developing regions, the sub-Saharan Africa continues to experience several setbacks including poor infrastructure, exorbitant costs of net-surfing and ICT hardware, lack of requisite expertise, security concerns and accessibility to the Internet.

The following sections of the article will examine these setbacks in contextual analysis.

Poor Infrastructure

Due to the abject poverty of most sub-Saharan Africa countries, the use of outdated (obsolete) equipment is commonplace, as most service providers cannot afford to purchase the much-sought-after state-of-the-art equipment. The equipment currently in use provides for low bandwidth connections that are not conducive in an e-commerce environment. The low bandwidth connections are a source of long delays and may therefore prove frustrating for an online activity. For example, Dellaert et al. (1999) found out that long delays during online shopping act as a deterrent to potential electronic dealings. At best the client may abandon the site or virtual store and switch to another site of their choice, and at worst the whole transaction may be abandoned.

Although many countries in the sub-Saharan region share this plight, South Africa has registered conspicuous success with relatively good telecommunications infrastructure. South Africa can no doubt be singled out in the region as having the lead in e-commerce in the entire sub-Saharan Africa region. For example, by 1997 Internet banking solutions were fully developed at the South African ABSA and NEDBANK banks and Internet access was already impressive.

Cost and Accessibility

The costs of accessing the Internet remain astronomical and prohibitive for most people in sub-Saharan Africa who generally have very poor socio-economic conditions. High tariffs for fixed telephone lines, which are being used to support dial-up networks, are a significant issue in many countries. Due to this, tele-densities are low in the majority of countries in the region and this has a spiraling negative effect on use, access and the profits of Internet Service Providers (ISPs). Many of the unwired parts are in the rural areas. Lack of connectivity of the rural areas where the majority of the citizenry live renders the Internet unavailable and e-com-

merce a pipe dream, and deprives entrepreneurs of business opportunities.

As would be expected, the costs for procuring computers in the sub-Saharan Africa are relatively high—so much so that not many entrepreneurs and households own them. As Duncombe et al. (2001) found, the situation is likely to persist for some time until enterprises are able to satisfy their information needs. Financial constraints are still hindering the greater use of ICT by small enterprises.

Lack of Expertise

Requisite expertise is required in order to effectively use e-commerce technologies like the Internet and the World Wide Web. However, currently the development of the necessary expertise often lies with the individual who simply "does not know what he does not know." In the developing regions, the issue of lack of expertise and lack of the financial capability are some of the biggest challenges facing the effective adoption of ICT for local community benefit. High illiteracy levels further compound the effects of these two factors. To successfully undertake an online activity, there is a requirement for some proficiency, mainly, in the English language because much of the useful content on the various Web sites is in English. Furthermore, the necessary training programs to enable people access to the Internet in the poverty stricken countries are expensive.

Because of the speed of enhancements on the Web, there is a paradox facing existing non-users as they grapple with supposedly "easier to use" interfaces but need an increasing depth of background knowledge to support ongoing use.

Security

Security has become one major element of concern in e-commerce. With the proliferation of computer crimes, it is certainly important for the potential clientele to become wary of cyber-crimes.

For any business dealing, the consumer ought to have trust and confidence in the retailer and the same applies to business transactions over the 'Net'. Chircu et al. (2000) and Hoffman et al. (1999) consider trust and expertise as prerequisites in the adoption of e-commerce technologies.

For any new users of the Internet, transactions on the Internet may appear untrue and somewhat unattainable. It is therefore incumbent upon the suppliers or the intermediaries to assure their existing and potential clientele about the security of their transactions. As Macklin (2000) argues, the issue of privacy or security of

electronic dealings is a significant driver for the use of e-commerce.

Cranor et al. (1999) observed that Internet users are reluctant to give their true details for fear of giving useful information to the wrong people who may hack into their databases. This in itself speaks volumes about the need for security in an online shopping environment. Suppliers of product offerings online need to be able to deal with such complex issues. This is of course a large task for micro-enterprises in the tourism and tourism support industry to address by themselves

In pre-empting an emerging environment, the Zambian government has a cyber-law bill awaiting Parliament's endorsement. This would go a long way in preparing Zambia for e-commerce options for many of its micro-enterprises. Other countries in the region are likely going to emulate this example. As Booz-Allen et al. (2000) suggest, the strengthening of existing laws is an important ingredient for the recipe of e-commerce adoption in developing countries. Most developing countries do not have necessary provisions in their laws to deter or curb cyber crime.

PROSPECTS FOR THE FUTURE: IS THERE ANY HOPE?

Despite the obvious drawbacks, the future for electronic business in the sub-Saharan Africa looks bright. As more and more people go online, electronic dealings will become inevitable. The connectivity of the sub-Saharan Africa and other disadvantaged regions of the world coupled with further technological advances in the already blossoming sector could be the major driving forces of e-commerce. For example, the prevalence of broadband Internet access provided by economical satellite links is one potential force that continues to boost further Internet usage.

Recent scholarly works indicate that current interest and enthusiasm is high and this points to a favourable rise in e-commerce activities. This could be attributed to the rise in the number of training institutions that are offering computer courses, the rise in entrepreneurial opportunities in the area of ICT, the need for research in academic institutions and donor-funded initiatives (Pigato, 2001). The proliferation of Internet Services Providers (ISPs) and cyber cafés is also a promising sign. For example, Malawi, just three years ago, had a single well-established ISP, but today over five ISPs have established a firm presence. E-commerce is also expected to receive another boost from efforts by the budding micro-enterprise firms to exploit the potential of the Internet (Coltman et al., 2000; Barwise et al., 2002).

CONCLUSION

There are obviously major constraints to the wide adoption of e-commerce across the disparate socio-economic conditions that exist in sub-Saharan Africa. However, it is quite apparent that partial adoption of e-commerce in higher socio-economic areas will further disadvantage people in lower socio-economic positions and, if anything, will widen the gap between the two. So efforts that encourage the effective use of ICT across the breadth of sub-Saharan Africa must be supported. The widespread adoption of e-commerce in and of itself is probably an indicator that there is increasing effective use of ICT in the region. If for no other reason, focusing on this can deliver a more vibrant situation where ICT is used for local community benefit and increase self-reliance across much of the region.

The current rise in the number of ISPs and local access points in the individual countries of the sub-Saharan region is one major indication of better Internet access in the region. As a result costs are likely to fall due to competition in an increasing market.

Many countries in the sub-Saharan region are also experiencing some economic growth and therefore the lack of capital may reduce as an overriding constraint. As already pointed out earlier, the existence of more service providers would lead to the falling of prices for Internet surfing and other ICT services.

In summation, the general mood is that e-commerce, whether business to business (B2B) or business to customer (B2C), has great potential in the sub-Saharan Africa. Its increasing adoption is an indication of more effective use of ICT, which is urgently needed to address the increasing gap between low and high socio-economic situations.

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KEY TERMS

E

Broadband: Internet connection with a download speed of more than 56k bauds.

Hack: To get access to the contents of a network's database without permission.

Information Superhighway: This is considered as a mixture of the full duplex (two-way), wired and wireless capabilities of telephones and networked computers with television and radio's capacity to transmit hundreds of programs.

Multimedia: This refers to the technology that presents information in more than one medium, including text, graphics, animation, video, music and voice.

Virtual Stores: These are stores (points-of-sale) on the World Wide Web.

Web Sites: These are locations of hyper-linked documents.

World Wide Web (WWW): This is a site where information is stored in multimedia form.

E–Democracy as a Contemporary Framework for Citizens' Deliberation

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INTRODUCTION

The emergence of new media has raised the hope of many politicians, citizens, political activists and scholars from various disciplines to establish a (virtual) space for free flow of information and communication for increasing the quality of democratic decision making.[1]

Interest in the impact of new ICTs on democratic processes and practices is not new. Since the 1970s visions on societal development have been discussed in context with an anticipated potential of ICTs to enhance various features of democracy, matched by a range of equally sceptical conceptualisations. However, policy developments have given a new focus to the study of electronic democracy (e-democracy), as a number of governments have begun to take seriously the potential and effects of these technologies.

Discussing all aspects of e-democracy is interdisciplinary work, it is driven by disciplines such as law, computer science and media studies. Although this inter-disciplinary work is valuable in that it provides a rich assessment of techniques and processes, it also highlights the need for an approach to the study of the topic that is explicitly led by the theories and methods of political science. The focus in this article is therefore not on the technological developments or legal requirements but on the technology of democracy, as, and this is the author's perspective, the source of innovation (ICT) is outside the political, or better, democratic process and primarily gives rise to issues of democracy again.

Given the intention to explain the role and decisiveness of generally participative and especially deliberative communication via new media within vivid democracies, several questions must be raised related to civic participation, political representation, the scope of decision making processes and political decisions (local community, regional, national, supra-national) and political accountability. The article intends to provide a summary of the main arguments and findings relevant for the usage of new media tools in the context of online participation and—deliberation.

BACKGROUND

Generally, ICTs are perceived as new tools to foster the social, economic and cultural development of regional, as well as over-regional, communities with regard to citizen's needs. New media have extended our understanding of civic engagement as they offer alternative methods for citizens to play an active role in the policy making process.

Given that e-democracy projects intend to increase the quality of democracy, but still "much of the talk about electronic democracy is loose and a-theoretical" (Hacker & van Dijk, 2000) it seems to be necessary, to discuss the theoretical basis of concepts of e-democracy and e-deliberation, involving theoretical aspects pertinent for analysing their potentials and constraints.

Literature (e.g., Coleman, 2004; Coleman & Götze, 2001; Hacker & van Dijk, 2000; Hague & Loader, 1999; Wilhelm, 2000) shows two mainstreams of discussion:

1. Technology shapes democracy—ICTs offer a new quality of democracy concerning inclusiveness and transparency of decision making processes. E-democracy is considered as the result of the presumably enshrined democratic potential in ICTs, high expectations concerning the electronic involvement of citizens accompany e-democracy projects at all levels of governance (Becker & Slayton, 2000).
2. ICT is a contemporary tool for the technology of democracy, which does not touch the dilemmata (public vs private interests, majority versus minority decisions, etc.) of democracy. Rather than regarding ICT as a means of transcending representative structures, it is seen as a tool for refreshing and strengthening the hitherto weak and neglected relation between representatives and the represented (Coleman & Gotze, 2001).

ORIENTATION

Basically, Zittel (2001) argues that e-democracy is inspired by two major sets of political ideas: Participa-

tory concepts and liberal democracy. According to his distinction e-democracy can be analysed on three levels: A general conception of democracy (e.g the liberal model) an institutional/structural dimension (democratic design), and a behavioural dimension (participatory behaviour). Both, participatory concepts and the liberal idea of democracy involve different views of citizenship. The individual as part of the political community sets the basic conception for the participatory ideal–he or she is, rationally thinking, able to submit individual interests to the common good. Citizens should become engaged in political processes as much as possible. The participatory idea involves elements of direct and representative democracy and is partly reflected in the "cyberdemocratic" and the "teledemocratic" paradigm. Becker and Slayton (2000) discuss this teledemocratic paradigm as "the coming age of citizen power" (p. 211), as it will answer the challenge of flattening hierarchies by engaging all those citizens in the policy making process who are disappointed with representative politics and not attracted to community politics. The key to a more truly democratic politics of the future, so they put it, lies in the greater realisation and materialisation of teledemocracy—a "new democratic paradigm" (p. 5) strongly interwined with the development of ICTs.

A "new democratic paradigm" based on the development of ICT, as the authors describe, is thought to transform representative government into a system much less responsive to traditionally organised pressure groups and more responsive to a broad base of its citizenry.

Simple majority, win-lose systems would give way to consensus building as the best way for polities to plan, decide, and administer the public sphere.

CONTROVERSIES AND PROBLEMS

Facing the problem that a number of already existing governmental e-democracy projects (whatever level of governance) lack usage and acceptance (Macintosh & Whyte, 2002), the author argues that high expectations are mainly disappointed because the promises of a new democratic design cannot be fulfilled–they neglect the discussion of existing structural problems of democracy per se, which occur whatever technology for decision making is chosen.

Several paradoxes do accompany democratic processes. We can see, that in a nutshell, they are closely related to *three dilemmas*:

- The dilemma of how to balance ideas of freedom and equality;
- the question of how to balance conceptions of representation and/or participation of citizens; and
- the question of how to generate collective decisions out of individual preferences.

To discuss these questions might be a better starting point for the analysis of digital participation options within a local, regional, national or even a supra-national context. Moreover, this approach involves all those aspects pertinent for *deliberative* communication processes, as deliberation is the core term accompanying discussion about increasing the quality of democratic decision making, either on or offline, ether on community or supra-national level.

Referring to Abromeit (2002), for reasons of orientation, it is a first step to identify key criteria illustrating some "hot issues" linked to the above mentioned difficulties:

- The definition of a *Demos* (the definition of the community, involving aspects of inclusion and exclusion, led by the main question: who is entitled to participate and what are the criteria for inclusiveness?)
- The role of the individual within a *Demos* (this includes concepts of self-autonomy, ideas of rationality and responsibility for the community)
- The pros and cons of political representation (this includes the question of which issues have to be discussed on a broad including level, when do we use mechanisms of representativity)
- The tension between majority driven decisions and the consideration of minority interests (private versus public interests, mechanisms to deal with conflicts)
- The context between decision making and the public legitimating of decisions (is there a link between institutional and non-institutional decision making processes and how should it be designed)

Against this background it seems clear, that every e-democracy concept/project is linked to interpretations of democratic participation, visions of citizenship and the public sphere, ideological concepts of democracy and the design and use (patterns, challenges and constraints of usage) of ICTs.

E-DEMOCRACY: A BETTER FRAMEWORK FOR CITIZENS' DELIBERATION?

Whatever ideological background, e-democracy concepts stress (again) the citizen's active role in opinion-formation and decision-making processes and presuppose his/her ability and interest to deliberate about issues of public concern.

The idea of a deliberative oriented democracy is not a new one. Literature shows that it can better be called a revival of earlier conceptions of citizenship when looking for solving the problems of representativity. *Deliberative Democracy* emerges from a rich history of debates on normative conceptions of how to find the best way to secure democracy as self-government and emphasises the necessity to develop inclusive and vibrant informal, political public spheres. Literature (Benhabib, 1996; Coleman & Gotze, 2001; Dryzeck, 2000; Fishkin, 1995; Habermas, 1996; Yankelowitch, 1999) also offers a number of normative conceptions for (online and offline) deliberation not to replace, but mainly to supplement the contemporary formal institutions of representative government. Deliberation per se is supposed to diminish deficits of aggregative procedures and those generally inherent to representativity as the discussion on democracy's paradoxa shows.

The "common good" or "issues of public concern" represent, from a communitarian or republican point of view, the content of deliberative discourses. All those (partly normative) conditions frame amongst others the model of a vivid public sphere which supposedly provides a (ideal) space for deliberative communication. However, the design and the significance of such spheres of debate and discussion are also subject to ideological influences. Political theory shows that some of those concepts determining deliberation within the public sphere are differently weighted and interpreted in various societal contexts. This appears to be important to emphasise in order to make clear that public involvement in issues dealing with the common good have been central to several political ideologies. ICT provide a new space for deliberation—but orientation concerning *purpose* of citizen involvement on various levels of governance needs further discussion of questions such as:

1. How do different political ideologies frame the citizens' role in society and how does that impact on the quality and design of deliberative discussions? How far may ICT contribute to deliberative communication including those who have been hitherto marginalised by the traditional media?

2. To find in depth-answers, why not following a very general approach ("Are we ready to respect the outcome of citizen's participation processes?" and "What kind of democracy do we want to support via ICT?").

DELIBERATION: ENHANCING THE QUALITY OF PARTICIPATION

Basically, there are several classifications of models of democracy (e.g., Goodwin, 2000; Held, 1996; Schmidt, 2000). With regard to the process of deliberation Held's (1996) general distinction between two approaches towards the categorisation of democracy models appears to be a useful starting point. Accordingly, he distinguishes between those supporting direct or participatory democracy and those focusing on liberal or representative democracy:

1. **Direct or Participatory Democracy:** Citizens are directly involved in decision-making processes dealing with issues of public interest.
2. **Liberal or Representative Democracy:** Citizens' interests are represented by an elected legislative body.

Deliberative processes can be detected in both approaches. The Athenian city-state, which can be subsumed under the school of direct democracy, enabled involvement in the democratic process through debate and deliberation and participation in a similar manner as most of the representative systems have done. However, depending on the respective schools of thought predominating in a society deliberation might be differently embedded in. Despite some obvious differences within the major schools of political thought there are, however, some overlaps and common ideas that can be detected when analysing their core thoughts (Huggins, 2002) in the context of deliberative processes.

Deliberation can be regarded as a special kind of communication taking place when: Political issues can be discussed at length; the communication process among the participants provides space for reflection; opinions and arguments are open for public testing and criticism (Wilhelm, 1999).

Considering deliberation as a process involving citizens interested in interaction with others necessitates analysing the different factors making up and determining deliberative processes. Evidently, those factors are shaped by political culture, the ongoing digitisation of information and communication and contemporary phenomena such as the localisation and

globalisation of socio-economic, political and cultural values, standards and beliefs and vice versa their influence on concepts of citizenship and the nation state. Moreover, deliberation is closely related to the (Habermasian) political public sphere involving complex concepts such as equality, freedom, reflexivity, empathy and sincerity (Graham & Witschge, 2003).

Cooke (2002) helpfully puts light at possible constraints (online as well as offline) of deliberation and presents a sum up on the main arguments commonly advanced in support of deliberative conceptions of democracy. As a reason to do this, she gives her own definition of deliberation, it "(...) is an unconstrained exchange of arguments that involves practical reasoning and always potentially leads to a transformation of preferences. Although public deliberation in this sense aims at rational agreement, I freely acknowledge the likelihood that it will fail to result in consensus" (p. 54).

FUTURE TRENDS BASED ON CLASSICAL CONCEPTS

However, Wilhelm (2000) states that "deliberation entails debate, discussion and persuasion in the public sphere" (p. 41). Deliberation means thinking through an issue, contemplating its advantages or disadvantages as well as the trade-offs associated with supporting a particular issue or agenda. If e-democracy concepts want to offer space for citizen's deliberation, a main consideration should be that this special kind of communication presupposes inclusiveness: the notion of a community and citizens being aware of such a community. There are scholars who argue that deliberative democracy requires social relationships or at least benefits from a shared regional/national identity. Hence, discussions about new forms of and new tools for citizenship are to be connected to reflections about status and ideological interpretation of citizenship which supposedly determine deliberative processes.

Citizenship is commonly understood as a membership in or to a community called nation/state. It is a complex part of collective identity and the concept comprises both, the relation between the individual and the state and relations among individuals within a state. Citizenship encompasses more than the passive acceptance of a pre-constituted package of rights.

Furthermore, debates on the conception of e-democracy should not neglect the notion of citizenship in the context of participative processes—which are closely related to the structural dilemmata of democracy mentioned previously:

1. Who is entitled to enjoy citizenship and what does citizenship entail for its holders?
2. Is citizenship based on a collective identity or does it derive from social policy?
3. Is citizenship restricted to the granting of individual rights or does it foresee and demand active participation in political processes?

Usage and acceptance of e-democracy tools: reflections on theoretical backbones

The prospect of using the ICT's potential for consensus-oriented democratic activities has been raised by a number of scholars. It has been argued that an online environment can provide space for inclusive public discourse, which is a substantive prerequisite of democracy. The merits of participatory democracy, or better yet deliberative democracy on local, regional or over-regional levels, have to be re-examined now that its technical support or feasability is closer at hand. But providing ICT tools does not automatically push towards an increased quality of democracy, as political communication via ICT can still remain monological, professionally produced and released for simple public consumption.

To sum up, e-democracy projects—on which governmental level ever—should take the following into consideration:

ICT can be a valuable tool for citizens and governments, if:

- expectations are discussed in the context of democracy's paradoxes
- expectations are discussed in the context of ideology, citizenship and the intended structure of a public sphere no matter if this concerns an online or offline environment.

E-democracy, enabling citizens' deliberation, is not a panacea for leading to consensus based decisions or the legitimisation of policies. But the use of ICT with the purpose of enhancing quality of democracy via deliberative oriented participation processes, can lead to a better formulation and acceptance of policies, if there is respect, response and influence in the policy making process guaranteed. This requires an in depth discussion on democratic concepts *before* choosing the appropriate tool.

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KEY TERMS[2]

Citizenship: A complex part of collective identity, concepts refer to the relationship between the individual and the community and between the individuals within a community/state.

E-Deliberation: Online public engagement with emphasis on the deliberative element. According to Coleman & Gotze (2001) public deliberation (independent from the tool) at it's best is characterised by:

- access to balanced information
- an open agenda
- time to consider issues expansively
- freedom from manipulation or coercion
- a rule based framework for discussion
- participation by an inclusive sample of citizens
- scope for free interactions between participants
- recognition of differences between participants, but rejection of status based prejudice.

E-Democracy: Various forms of online public engagement, from e-voting to e-deliberation. E-democracy (the short form of "electronic democracy") is the utilization of electronic communications technologies, such as the Internet, in enhancing democratic processes within a democratic republic or representative democracy. The Internet especially is viewed as a tool that finally helps to eliminate the distance constraints in direct democracy. It is also viewed to improve the quality of opinion formation by opening new spaces of information and deliberation. It is important to note that e-*government*

is a distinct from, but may overlap with other ICT techniques being used for making government operate more efficiently.

E-Government: is a term used to describe several closely related topics, generally it is agreed to derive from 'electronic government' which introduces the notion and practicalities of 'electronic technology' into the various dimensions and ramifications of government. The most frequent use is related to:

- The delivery of public services, where there is an 'online' or Internet based aspect to the delivery of the services (online government services are sometimes called e-services
- The conduct of government business where the activities of those involved in the process of government itself (such as legislators and the legislative process) where some electronic or online aspect is under consideration.
- Voting where some technological aspect is under consideration

Electronic Voting: A term used to describe any of several means of determining people's collective intent electronically. Electronic voting includes voting by kiosk, internet, telephone, punch card, or optical scan ballot.

Internet Democracy: A derivative term for e-democracy/electronic democracy, especially related to projects and concepts centred on using the Internet (and not other electronic communications technologies like short message services or teletext) for deliberative and participatory aims. Concrete implementations of internet democracy projects include electronic town hall meetings or citizen consultations, the use of discussion boards on party or candidate websites and the virtualization of traditional political institutions or mechanisms like party conventions, protest marches or petitions.

Paradoxes of Democracy: Every conception of democracy is differently weighted in relation continuums:

- Freedom-equality
- Majority-minority
- Participation-representation (individual-collective interests)

Participatory Democracy: A broadly inclusive term for many kinds of consultative decision making in a democracy, as direct or deliberative democracy.

ENDNOTES

1 Aspects of this article base on the research project: Europeans Have A Say: Online Debates and Consultations in the EU; conducted in cooperation with Roman Winkler, Institute of Technology Assessment, Austrian Academy of Sciences. This project was funded by the Austrian Federal Ministry for Education, Science and Culture within the NODE-research pogramme from July 2003.

2 Key terms: additional references used:
http://www.publicus.net/articles/edem resources.html
http://itc.napier.ac.uk/ITC_Home/

Education Trends in Thai Businesses Utilizing Information Technology

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INTRODUCTION

There is a "deep-rooted inequality situation in the Thai economy and society" (Krongkaewa & Kakwanib, 2003). This inequality permeates all aspects of Thai society, highlighting Thailand's current economic vulnerability as they try to address policies that will support sustainable growth while reducing these inequalities. With growing concern about the digital divide, Thailand is an important and interesting region to study. These concerns have highlighted a widening technology gap causing a "new type of poverty called information poverty" (Marshall, Taylor, & Yu, 2003; UNDP, 1998). There has been very little prior research that has examined the take-up of information technology in this region. Although the digital divide has been the concern of all countries, there are now additional concerns about the information divide, which could increase further the gap between developed and developing countries. Education has been highlighted as an important area of policy focus. However, should developing countries such as Thailand be targeting their education resources towards specific fields that will support research and development into new technologies aimed at reducing the digital and information divide? "Women produce more than half the world's food and spend most of their income on family welfare and food, but a lack of access to services, education and technologies keeps them uninvolved in the decision-making processes" (Sarker, 2003). Due to this lack of skills or literacy, women are unlikely to be able to directly use or even to understand the importance on information technology (Sarker, 2003). Thailand's policy commitment to advancing science and technology should be in juxtaposition with higher "educational expenditures, technical training, and building institutions necessary to create a knowledge society" (Wilson III, 2000). This would support the notion that "pro-poor public access policies" would help overcome some of the educational and access barriers, as long as they were developed with "effective regulatory mechanisms" (Sarker, 2003). This research incorporates an analysis of educational trends within 31 non-agricultural Thai businesses in Chiang Mai, with a collective total number of employees of over 3,000, that were subjects of a pilot study conducted in the north of Thailand. This article considers the educational trends of employees in these businesses, which may support electronic enablement and digital divide reduction.

LITERATURE REVIEW

It is widely agreed that "Information Technology is important for developing countries in alleviating information poverty, enhancing competitiveness, improving public sector management, participating in global trade and production, and promoting environmentally friendly development" (Hanna, Guy, & Arnold, 1995; Marshall et al., 2003; Norris, 2001). To achieve these goals governments in developing countries need to implement policies that will encourage education in fields that will support technology development, and strategic research and development projects that the government may have in place. Education is also one of the matrices commonly used when assessing the development of a country. When reporting development indicators for Thailand, the National Statistics office of Thailand reports on three areas; Educational Budget, Sex Ratio by Education Attendance, and Literacy (Ministry of Information and Communication Technology, 2003). When considering the information and digital divide Mossberger, Tolbert and Stansbury (2003) clarify two significant areas of "basic literacy, prose and document, which are clearly prerequisite skills required for information literacy in the context of using resources on the Web" (Mossberger, Tolbert, & Stansbury, 2003; Penuel & Kim, 2000). Education in basic literacy, therefore, is required to reduce the information divide, and thereby offering further reduction in the digital divide. This is an area being addressed by developed nations in relation to their own information divides, but Thailand faces a further divide, that being a language divide, as English is the second language and therefore poses an additional hurdle to the information divide. Basic literacy in the Thai language is also measured and reported by the National Statistics Office (National Statis-

tical Office, 2003c). This area needs to also be evaluated, as basic first language literacy will enable Thais to access Thai information and thereby reduce any national information divide, but this aspect of development is not covered in this study as we are more specifically interested in the global inclusion of Thailand and its reduction of the information divide in the global community. Thailand's "policy challenge is how to offer assistance to those who lack basic literacy skills in English to reduce this divide, or at least to assist those who are interested" (Mossberger et al., 2003).

METHODOLOGY

Education

The educational levels of employees in the businesses in the pilot study were recorded to offer some indication of the level of education being achieved and employed in general. There was a 2.44% disparity between the number of employees indicated and the answers to the highest education level achieved by those employees. The questions asked for a response for both males and females, indicating how many employees had the education levels of: (1) No formal Schooling; (2) Primary School; (3) Secondary School; (4) Technical or Further College education; and (5) University or Tertiary Institutions.

The results of this pilot study then considered the national statistical information for the period 1999-2003, to consider national trends toward education. We further discuss whether these national trends, considering basic Thai literacy, could highlight development and educational opportunities or whether they are indicating significant progress that would support the reduction of the digital divide globally for Thailand.

Language

A further supposition was that the inability to interpret from English to Thai could inhibit research and development projects in Thailand and widen the information divide, thereby posing a further hurdle for the electronic development of Thai businesses.

The questions asked in this section were self-selection answers for both male and female staff indicating their level of skill in the following areas of speaking and reading English. The choices for answer were: (1) Very well; (2) Well; (3) Not well; and (4) Not at all.

There were no statistical reports found that tested English language speaking or reading ability. As English is considered the second language in Thailand, reporting speaking and reading ability would be a significant factor measuring English literacy, and in turn offering determi-

nants for the information divide. Questions pertaining to English Language speaking and reading ability should be considered for future statistical recording and reporting purposes by the National Statistics Office of Thailand.

DATA ANALYSIS

Education

The responses to the highest level of education achieved, Table 1, indicated a high level of education in both male and female employees, indicating 95% of their employees had received some form of formal education. This is further supported by the Literacy Rate statistics indicating high literacy rates of 92.6% for those people ages 15 years and over in 2000, with higher rates of 98% literacy found in those people between the ages of 15-24 (National Statistical Office, 2003a). Although there was an indication that the male/female employee ratio was in favour of males by a ratio of 1:2.03, the ratio of males/females with formal education indicated a ratio of 1:1.23 in favour of female employees.

The highest education level achieved indicated an overall higher level of education in the women employed compared to the men employed (Table 1), except for a slight variation in the technical or further college education category.

These findings seem to indicate some disparity between the subjects studied and the national statistics, as shown in Table 2, where there is a national indication that would indicate higher levels of educated males than females. In considering this apparent disparity it should also be highlighted that the businesses in this pilot study were non-agricultural by trade and were businesses within the Chiang Mai municipality, which could indicate some disparity between Table 1 and Table 2. Table 8, Appendix A, provides evidence that approximately 41% of the Thai population are engaged in agriculture and fishery. Additionally 7% of the Thai population were included in the

Table 1. Highest level of education achieved responses
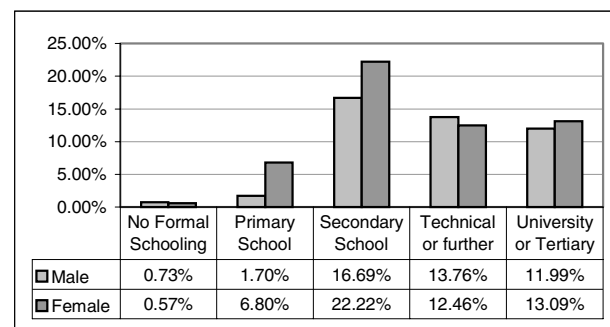
	No Formal Schooling	Primary School	Secondary School	Technical or further	University or Tertiary
Male	0.73%	1.70%	16.69%	13.76%	11.99%
Female	0.57%	6.80%	22.22%	12.46%	13.09%

Table 2. Number of population aged 15 years and over by skill development, level of education and sex (Source: National Statistical Office, 2003c)

	No education	Less than elementary	Elementary	Secondary	Higher level	Others	Unknown
Male	812,134	8,153,1	5,306,4	7,194,7	2,268,3	10,315	64,596
Female	1,738,7	9,216,4	4,638,2	6,096,7	2,500,7	11,576	57,032
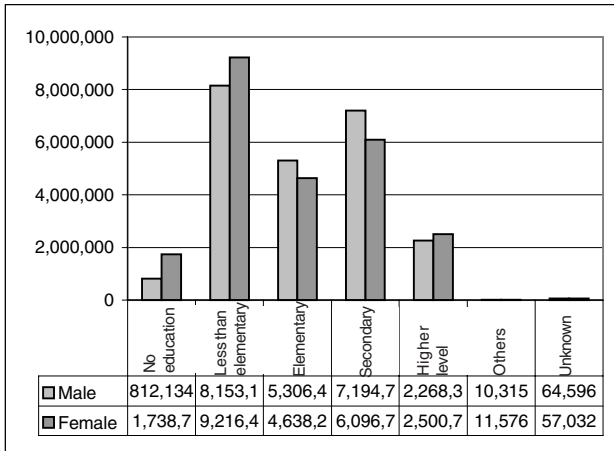
group indicated as Legislators, senior officials and managers, that would have been considered government bodies, were outside the scope of this research. This therefore accounts for 48% of the population, statistically, falling outside the scope of the research. With this disparity considered, a further analysis was required indicating the occupation by gender as shown in Table 9, Appendix A. Table 9 shows a higher employment

rate for females as Technicians and associate professionals, Professionals, Clerks, Service workers and shop and market sales workers, and Elementary occupations, all occupations that require a higher education and businesses that would have been included in the pilot study conducted. To support this perspective Table 10, Major of Education for Internet users, Appendix B, is offered to show the types of education that Internet users have, offering significant support to these statements, although the information offered in this does not provide a breakdown of males and females in these occupations, therefore no gender conclusions can be made.

Language

There were no tests or scales for testing English language skills provided, which left the interpretation of the scales to the subject answering the questionnaire. Of those surveyed 26% chose not to answer the language section of the questionnaire. Although this is almost a third of the subjects surveyed, those subjects that did respond to the language section offered a view of language use in Thailand that is in opposition to that initially taken by this study and further supports the opportunity for early advancement in the e-enablement of businesses within Thailand and an indication that the opportunity for the reduc-

tion of the information divide is possible. A number of anomalies need to be identified here. The responses did not reflect the Male/female ratio indicated in the business profile questions as shown in Table 1 so the only analysis available was a breakdown of the responses by gender. Further analysis was conducted removing those businesses that comprised large businesses as defined in the Business Profile section of the survey, to test whether their answers would impact the overall results of the analysis. As the results shown in Table 3 indicated only a marginal difference, our analysis included all responses to this section of the questioning, in order to avoid bias but also to highlight any significant anomalies that occurred in the results of the analysis.

Table 4 shows the raw data responses for the Language responses for males and females. Although the responses for males in this section were quite low, those subjects that did answer the question regarding language for the males that they employed indicated that approximately 69.66% of their male staff could speak

Table 3. Language responses variances male/female (LLB = less large languages)

	Speak All	Read All	Speak LLB	Read LLB
Male	27.19%	26.70%	26.59%	29.26%
Female	72.18%	73.30%	73.41%	70.74%
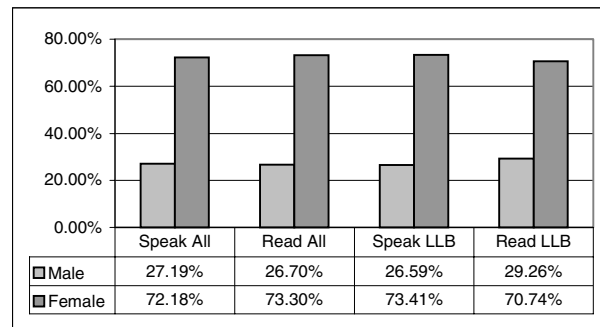
Table 4. Language responses variance detailed
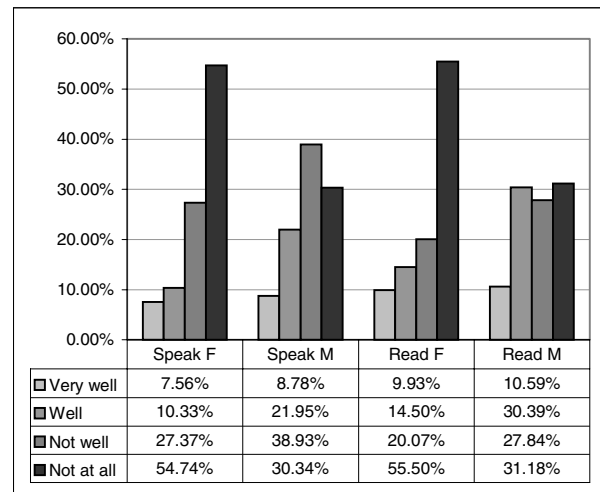
	Speak F	Speak M	Read F	Read M
Very well	7.56%	8.78%	9.93%	10.59%
Well	10.33%	21.95%	14.50%	30.39%
Not well	27.37%	38.93%	20.07%	27.84%
Not at all	54.74%	30.34%	55.50%	31.18%

English to some degree while 68.82% of males employed in the businesses surveyed were indicated as being able to read to some degree. The breakdown of the responses indicates that the majority of these responses fell within the can speak/read well and not well sections, with subjects indicating that approximately 30% of male staff they employed did not speak or read English.

The responses for females in this section were quite high indicating that approximately 45.26% of their female staff could speak English to some degree while 44.5% of females employed in the businesses surveyed were indicated as being able to read to some degree. The breakdown of the responses indicates that almost half of these responses fell within the can not speak/read well section, with subjects indicating that approximately 55% of female staff they employed did not speak or read English.

The male/female variance for English language speaking highlights a disparity that is significant from a perspective of sharing information and knowledge at the global level, as English is being promoted as the second language in Thailand and is being promoted in academic circles as the international language for sharing information and knowledge. As there were no Thai national statistical studies of English use in Thailand, for some language indication we referred to the National Electronics and Computer Technology Centre's Internet User Profile, a survey that has been utilised over the past five years. This report, although still developing, is a very detailed report that offers some insights into English language use by people who would fall into similar occupation categories as those surveyed in Chiang Mai. Although Table 5 shows the English proficiency of Internet users, there is no further breakdown offered that might indicate the proficiency difference between males and females. Therefore Table 6 has been included to at least offer some gender variance in Internet use with an assumption that this could also impact the increased use of English by the respondents.
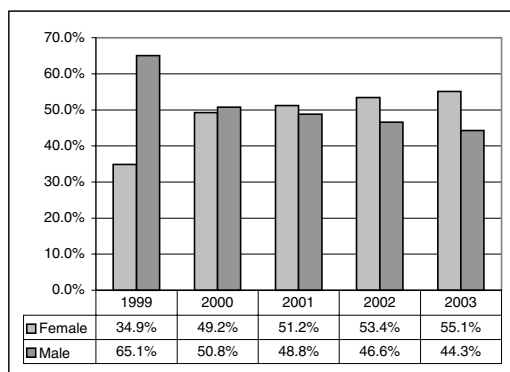
In order to support this assumption we have included the Top Activity on the Internet by Gender (Table 7), but this also can be distorted as Thai language is used on most Thai Web sites with limited English use and as there are no indications as to which sites are sourced from these users it is difficult to assess how much English language is being used in these activities. There does highlight however an opportunity to further investigate these areas in the hope that this might offer some indication of the literacy skills that this multi-language culture will require in reducing the information and digital divides, while becoming e-enabled.

DISCUSSION

Education

This research highlighted results about Thai Education and Language used in businesses in the northern province of Chiang Mai, indicating a high percentage of females were employed with higher educational levels than the males employed. This trend was also identified in the language speaking/reading responses, with female language responses being significantly higher than the male responses. The language responses were the CEO's perception of the level of use and understanding of the English language by his/her employees. There was no evidence gathered pertaining to tested levels of English used by employees. With approximately 75% of the ratio of male-female within the Thai organizations surveyed being 1:1.1 to 1:2 the organization profile seems to indicate that women are pursuing higher education before entering these Thai businesses. These results show a higher educated and therefore developed organizational profile than was expected when researching in a regional area in what is referred to as a developing country. Although the

Table 5. Internet use by gender 1999-2003 (Source: NECTEC, 2003)

	1999	2000	2001	2002	2003
☐ Female	34.9%	49.2%	51.2%	53.4%	55.1%
■ Male	65.1%	50.8%	48.8%	46.6%	44.3%

Table 6. English proficience (Source: NECTEC, 2003)

	Excellent	Good	Fair	Limited	None
☐ Percent	6.6%	36.2%	43.9%	12.8%	0.5%
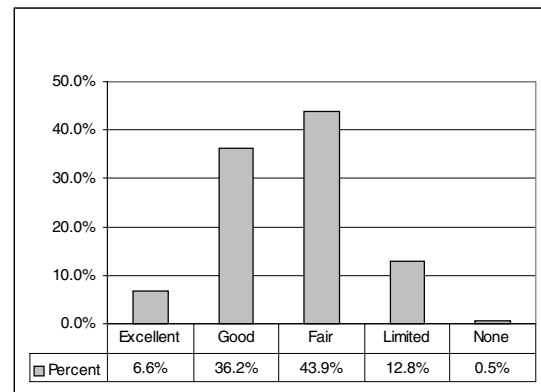
Table 7. Top activity on the Internet by gender (Source: NECTEC, 2003)
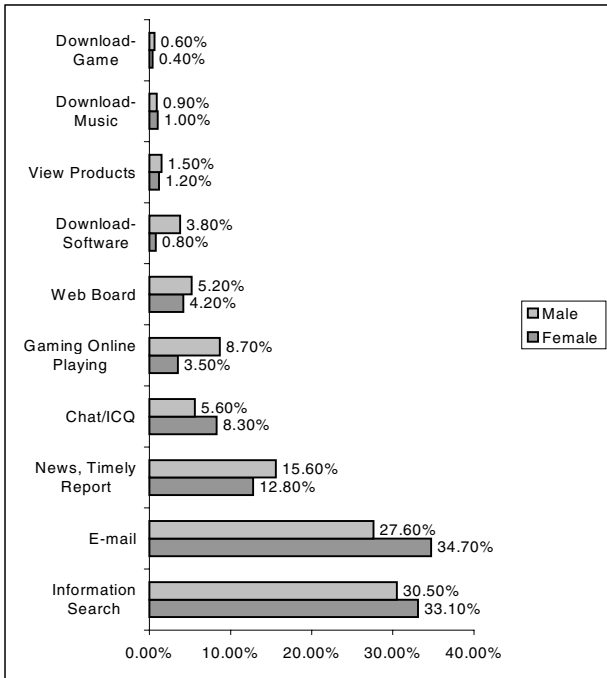
national statistics diverge from our survey results, when considering only those occupations that would fall into the bounds of the surveyed businesses, the results do seem to follow the same trends.

Language Limitations

Researching in Thailand as a non-Thai speaking, reading or writing foreign student had some impacts on the processes of this research. Research conducted by external researchers offers the opportunity for developments within a developing country to be shared by the wider global community as well as providing significant statistical information about these developments offering possible opportunities for other developing countries to utilise. Although English is taught in most schools and colleges throughout Thailand, the access to research translated into the English language, which is conducted by Thai students within the country or by Thai private and Government companies, is difficult to come by. A striking feature during the research process was the lack of information available that was translated into English for referencing and or international recognition by other jurisdictions. In fact a number of documents and research papers were available that could have been useful in this research but, due to time, translation and language constraints were not able to be used. A number of publications had English references or summaries but contained

Thai language detail. Initially a number of research papers, reports and published Thai Government reports were offered by the Thai Government and other significant industry sector companyies (NECTEC), to assist in this research, but these documents were not translated into the English language, which made it difficult to determine their relevance to this research and which could impact the bias of this research. There were, however, a number of other statistical reports that are produced using both Thai and English. These, although limited in number, were of great use within this research. The encouraging signs of the outcomes of this pilot study were the amount of information available on the Internet at universities and Government centres across Thailand. A number of software language translators, such as BABELFISH, were investigated, but are also unable to translate Thai to English. It would be encouraging to see all research papers and public reports available in English so that international researchers are able to support and reference the work being conducted in Thailand, as well as enabling Thai researchers the ability to have a voice in the wider research community. It must be noted here that this study could not include research from Thai universities and Government reports that were not translated into English, which may have impacted on the results and focus of this study. Researchers working in Thailand should take this into consideration when preparing information of significance and benefit to Thailand and or other developing countries. It is not envisaged that these limitations had any significant impact on the results of this pilot study.

CONCLUSION

This research incorporated an analysis of educational trends highlighting the apparent higher education of females within Thai businesses that were subjects of a pilot study, in the Chiang Mai province of Thailand. This apparent trend offered unexpected results as the employment ratio indicated, on average; there is only one female employee for every two males employed. Education is considered an important factor for development and reports of educational development within developing countries, such as Thailand, are often used to indicate a certain progression toward development. This research further highlighted a disparity between national trends and the businesses studied, although it has been argued that by limiting the national survey information to the specific occupations being studied indicated support for the findings.

English is considered the second language of Thailand, so it was surprising to experience difficulties in locating research information on Thailand translated into English. Consequently we surveyed the use and acceptance of English in the work place with the view of

assessing whether a lower proportion of English usage could explain why research and other studies were not being made available in English as well as Thai. The results of the language questions provided some confirmation that while females were often more educated than males, their English language skills were significantly lower in comparison. This finding provided support for the contention that research produced by these educated females might be difficult to locate written in English.

Although we have argued here that there is significant use of the English language and that educational trends support the reduction of the information divide within Thailand, the national statistics do not provide clear support for this argument. However, the national statistics do provide evidence indicating that a growing information divide is exacerbating the digital divide that already exists within Thailand.

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KEY TERMS

Digital Divide: The term broadly used to indicate the difference between technologically enabled groups, societies or countries and those groups, societies or countries, which do not have the same or similar levels of technological enablement.

Information Divide: The term broadly used to indicate the difference between groups, societies or countries that have ready accessibility to information and those groups, societies or countries, which do not have the same or similar levels of access to this or similar information.

Gender Divide: The term broadly used to indicate the difference between males and females that have ready accessibility to information and technology, and the skills to use information and technology, and those males and females, which do not have the same or similar levels accessibility to information and technology, and the skills to use information and technology.

Language Divide: The inabilities to understand, communicate, receive or transfer information in a recognised language of the person's state or community.

APPENDIX A

Table 8. Number of employed persons by occupation (Source: National Statistical Office, 2003b)

Table 9. Number of employed persons by occupation and sex (Source: National Statistical Office, 2003b)

APPENDIX B

Table 10. Major of education (Source: NECTEC, 2003)
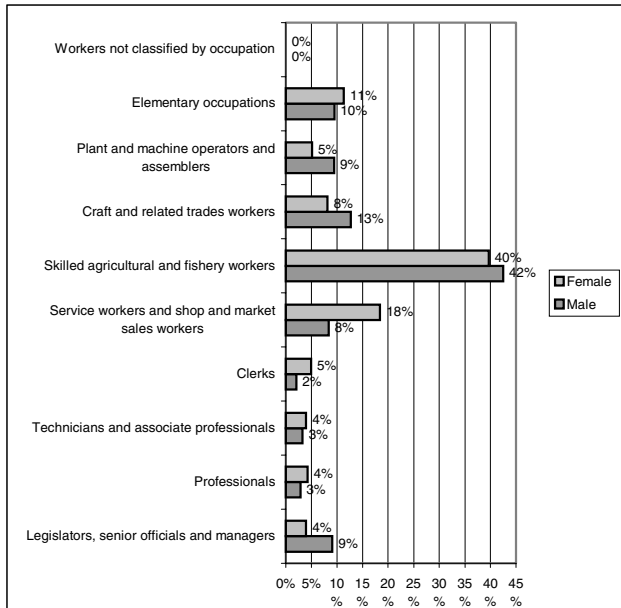
E–Government and E–Democracy in Latin America

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INTRODUCTION

Latin America is suffering from many of the negative consequences of globalization, without benefiting from many of its advantages. Among the advantages are those derived from the increasing availability of ICT and from the potential development of citizens' participation to foster e-democracy. In general, the corporation of ICT have not been carefully thought through by many of the governments in LAC. In the case of e-government, the effects of the underlying relationship models between government and society as portrayed on each country's main portal site (hereinafter called "portal") not only vary but generally do not show any appreciation of the transformation of government services. Mexico, Peru, Chile, Venezuela, Uruguay and Brazil appear to be engaged in the early processes of modernization of services, networking, and online access to governmental administration. The rest of LAC appear to be well behind these countries efforts.

BACKGROUND

Definitions and Existing Models

Before examining the detail of developments of e-government in LAC, it is necessary to go through some definitions of models of Latin American e-government and e-democracy described by academic literature. The World Bank, refers to e-government as the means to update public management through the use of Information Communication Technology (ICT), searching for better practices, delivering more control, efficiency and transparency. E-government is the opportunity for users to access and actively participate in public services, in a more flexible way, without the need to go to government offices (Araya Tagle, 2003).

Stephen Clift, a respected world authority on e-government has developed a useful definition of e-democracy as follows:

E-democracy represents the use of ICT (...) by democratic actors (governments, elected officials, the media, political organizations, citizens/voters) within political and
governance processes of local communities, nations and on the international stage. (Clift, 2004, p. 39)

It is suggested that "e-democracy" may also become a means (through ICT) for people to participate more actively in deciding the agenda of public politics. This constitutes a further development of the democratic process that goes beyond a representative system. This concept is referred to in this article as referring to a broad view of "e-government and e-democracy."

Existing Models of E-Government and E-Democracy

With the increasing availability and use of ICT across the world, government policy makers, elected officials and scholars are beginning to explore new models of democratic processes under the titles of "e-government" and "e-democracy". New forms of discourse to describe principles, practices, evaluation and models are emerging. For example, the OECD (2001) defines three types of interaction between government and its citizenry—(1) *one-way information provision*, in which the government decides what information to provide without consulting citizens; (2) a *two-way relationship* where citizens have the opportunity to give feedback on issues; and, (3) a *partnership relationship*, in which citizens are actively engaged in policy-making (G2P).

The first approach is only informative and does not produce changes in the traditional form of representative government. Porras (2003) calls the second approach "The Consultative Model." However, the use of this approach does not generally cause significant transformations in the way a representative government operates. Although governments consider it relevant to keep the information channels with their citizens permanently open, they are not seeking consensus but providing just information. For Porras the third approach is referred to as "The Participatory Model"; using this approach implies a deep transformation of the concept of representative governance. In this paradigm, the government acts more as a facilitator in the governance process. Its usefulness and effectiveness depends on the government's ability to coordinate the interdependent social agents involved.

The decline of political participation in many societies could indicate that people do not believe in the effectiveness of modern day representative governance. It may also suggest that the way to rebuild interest in governance could include measures that go beyond voting (representative democracy) but should be extended to involvement in every day matters of governance as well. At this point, the boundaries between e-government and e-democracy become blurred. Therefore, it becomes necessary to generate mechanisms to survey citizens´ claims and proposals for better government services.

The relationship between government and society can be even more complex through the so-called "Networked Governance" (Figure 3), where stakeholders as partners (non-governmental and the private sector) join in with public agencies to design, implement and evaluate policy making connected with daily events (Börzel, 2001; Caldow, 2004; Girard, 2002; IADB, 2004; Norris, 2004)

Proposed Models

New variables are added to the above mentioned models: e.g.:

- relationships between bureaucracy and technology
- scale of impact[1](Mackintosh, 2003); and
- communication according to users' profiles;
- non-public sector integration;

In order to categorize the Latin American experience, it is useful to describe the existing e-government models that result from current practices as observed and analyzed by the author. LAC countries have their own characteristics, needing the development of their own specific models. These models are:

1. **Technological Model** (see Figure 1): This model has some definite limitations to incorporating ICT into government decision making in a way that maxi-

mizes the potential of ICT. Some basic concepts of this model are:
   - It assumes that technology acquisition automatically implies positive effects.
   - It is a government-centered model, which generates incomplete institutional information, without any degree of participation from non-governmental actors. No consideration is given to two-way communication.
   - This approach to e-government considers the appropriation of ICT in government is largely a matter that belongs to I.T. professionals and does not give any prominence to the potential for collaboration of public policy.
   - It considers that e-government implementation consists of building portals featuring some official information (Informative Model), a little technology, and some governmental internal electronic procedures, all overlapping the existing bureaucratic structure.

2. **Managerial Model** (see Figure 2): This model is characterized by the use of digital technologies to maximize the government's efficiency in the provision of services (Porras, 2003). The first step is the application of the Internet and ICT to internal procedures and exchanges between different government levels. Expected benefits are substantial improvement in efficiency and cost reduction, as well as promoting internal unity among the different governmental agencies. This model basically combines ICT with the reengineering of the organizational structures. It provides electronically enabled basic services and applications such as online services, e-procurement, support to small and medium enterprises (SMEs), directory of agencies and public officials. Its scale of impact is mainly local.

Figure 1. Technological model
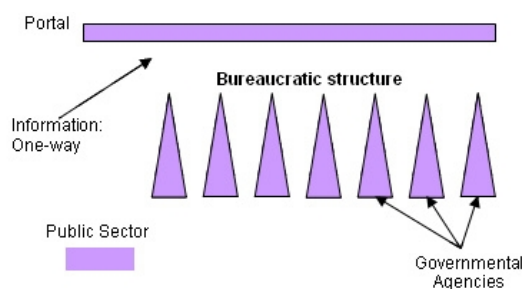
Figure 2. Managerial model
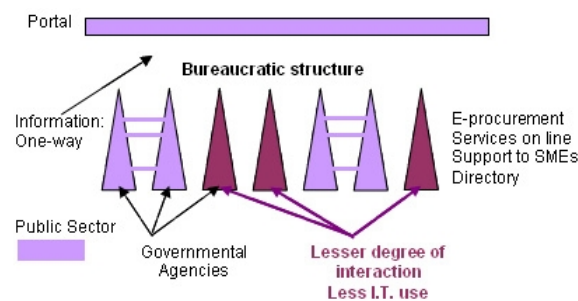
THE LATIN AMERICAN EXPERIENCES

As the World Wide Information Society grows (Bonilla, & Cliché, 2003; Finquelievich et al., 2003), some LAC countries have launched their own forms of e-government. The first steps have been based on the technological and informative models, although a few LAC countries have advanced to more rational models of technology use. Brazil and Chile were the first LAC countries to implement e-government, in 1995. Their most comprehensive programs were developed in 1999 (Reilly, 2004). In 2000, Brazil made public the "Green Paper on The Information Society." In 2002, Chile published the "2002-2005 Electronic Government Agenda". Meanwhile, in 1998, Argentina launched its "Argentina – Internet for All" plan, inaugurating governmental Websites and a National E-Government portal (Kaufman, 2004, p. 159). Peru started the "E-Peru Project" in 2001 and the "National Policy for Information" in 2002, announcing its "National Strategy for Electronic Government" for the year 2003. These efforts are examined here on the basis of the above described e-government (and e-democracy) models, official documents, literature survey, and through an examination of some of the relevant government portals that took place in 2004[2].

The variables chosen to analyze the portals are:

- Evidence of participatory models;
- Tailoring content according to the target population;
- Breadth of information, ranging from that provided to all citizens as a whole to information provided to users considering their different profiles (such as businessmen, researchers, workers, general community members, etc.);
- Level or scale of impact: global, national and local;
- Existence of government-centered institutional goals deduced from the content of the portals. If content is not self-centered, the degree to which the institutions are committed to the users, considering:
  1. the target population's language;
  2. the target population's logic;
  3. mechanisms for actual participation.
- Finally, which of the three main models outlined above best describes the approach evidenced in the official portals?

Portals

Chile: www.estado.cl

The portal has a primary aim at local impacts and directly addresses the citizens. The information provided always relates to the public agenda and its objectives are largely referred back to community. The language used is not institutional but colloquial. It is modeled on the UK Government portal which uses alphabetical searches, adopting the Your Life or "life events" scheme (www.ukonline.gov.uk). However, while participatory mechanisms are included in the UK portal, in the Chilean case, information circulation is only one-way (Informative Model). Nevertheless, it is a good attempt to divide information in "life events", referring citizens to the institutional paperwork based on major life time events such as having a baby, starting school, getting married, etc. A fairly well developed thematic search engine offers another way to make information more easily accessible to community based users. A special page is titled "Production and Promotion", which provides language options, offers training tools and includes economic sectors by participation.

Argentina: www.gobiernoelectronico.ar

The Argentine E-Government portal offers institutional information in official government type language. Programs are called by their official names, so it is necessary for community users to have a basic knowledge of the government's terms in Argentina. The existing thematic classification is not fully developed (Science and Technology; Economy and Business, Education, Social Policy, Health, and Work) and the primary target audience seems to be civil servants and institutional experts.

There are no indications of an intended interaction between the government and the citizens. No thematic search engines or indexes are found on this site. Whilst the portal provides information, it provides only a few transactions possibilities on line and these focused mainly on the payment of taxes.

Venezuela: www.venezuela.gov.ve

This is mainly a political portal, focused on supporting President Hugo Chávez and the constitutional reform that has been implemented. The language style is colloquial, without official terms, but government-centered. The target is the national population, and it provides information about public services. In the section "Círculos Bolivarianos" (Bolivarian Circles), registration forms allow the citizens to integrate into a social network which is directed at backing up Chavez. These "circles" are in charge of receiving community problems and managing procedures before the corresponding authority. From all the surveyed portals, this is the only one where the button "Contact us" leads to an e-mail that belongs to the Presidency (presidencia @venezuela.gov.ve). Moreover, the portal offers the possibility of watching and listening to the President live.

Perú: www.peru.gob.pe

The Peruvian portal mainly provides information services to citizens, and specifically to SMEs. As in the Chilean case, it aims at local impact except for economic issues. It provides a Government Directory (an A to Z search facility, similar to the Chilean portal). The "PROM PyME" page, addressed to SMEs, is the most developed page, featuring services provided for foreign trade, investment, finance, and support to business managers, through a "Tool Box for SME Management". It includes a Directory of enterprises and statistics for the economic sector. The portal also provides a form to report corruption.

Brazil: www.governoeletronico.gov.br

This portal, mostly addressed to the local community, shows a clear intention to achieve a global impact on the economy. It exhibits a displayable thematic index, with options for users to personalize it. This is the most advanced among all the portals surveyed. Different types of logic are clearly assumed for different types of citizens. Citizens as well as other types of users such as business and government agencies are considered. There are references to information networks for public and private services that are not generally available within the region. Information is provided in colloquial language and catergorised as: children and teenagers, electronic government, banking, support for the disabled, assistance for school research through thematic content sections. It provides a "Citizen Glossary", information and contact with the police, academic and governmental job opportunities, senior citizens, etc. It is a clear example not only of tailoring content according to the users but of transactional and interactive practices as well. The following menu pages can be found: credentials and authorizations, pensions and retirement, assistance centers, utilities, telephone, payments to government, small-scale farmers, judicial procedures, and so on. "Who is who" leads to the first portal found for consultation with civil servants. This portal is extremely important because it implies possible communication with actual officials.

The portal generally includes "Enquete" or "Enquiries" attached to most Web pages. For example the OBRANET program (related to Public Works), asks users to participate with opinions and initiatives. Throughout the portal, there is an implicit intention to bring the Brazilian e-government closer to a participatory model. This is evidenced through consultation mechanisms for public input with fixed dates for particular participation topics, ways to vote and discussion forums. The page "Instale Rede Governo", offers a proposal to integrate public and private information networks.

PROPOSITIONS AND FUTURE TRENDS

During the last ten years, significant changes have taken place in the development of digital governance. Although "The Managerial Model" still prevails, there have been crucial advances oriented towards the implementation of "The Consultative Model" or "The Participatory Model" as well (Porras, 2003). These models are often found embedded within networked governance structures (see Figure 3) The Latin American scenario is not, precisely, the above mentioned. In order to become such, a different look should be taken at e-government, not only technologically but politically and socially as well. The public sector should incorporate different social science disciplines, in order to design tools and models.

The development needs to:

- Identify and record better practices.
- Research permanentlyon specific conditions needed for each local or national context.
- Develop research methodology to categorize a universe of possible users, specifying different types of data processing with identified sectors.
- Implement strategies to better communicate between public and private sectors.
- Reengineer government structures to this process, which implies a strong training causing necessary cultural changes.
- Develop public policies encompassing and linking e-government and e-democracy.

CONCLUSION

From the elements described above, the following conclusions are derived:

Figure 3. Networked governance model
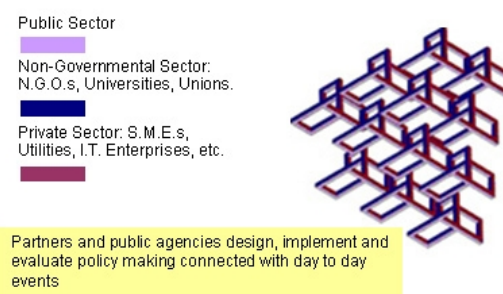
- The possibilities of the global impacts offered by the Internet are not exploited in LAC countries. At first sight, no language options are noticeable.
- Community participation is not encouraged (except for SMEs).
- The assumption that technology acquisition implies automatically positive effects (Technological Model) seems to prevail; although there is an incipient managerial model in Chile, Peru and Brazil (Ferrer, 2003; Kaufman, 2003). Consequently, the most common models are technological and informative.
- Information is considered from the government's perspective, not taking the population into account, except for Chile, where the government provided information (one-way), and Brazil which has established a two-way public relationship (Consultive Model).

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KEY TERMS

Active Participation: Citizens are actively engaged in the policy-making process. Government acknowledges citizens as partners; citizens participate proposing policy options and shaping the policy dialogue.

E-Democracy: The "use of ICTs by democratic actors … within political and governance processes of local and national communities, and on the international stage" (Clift, S.L., 2004, p. 39).

G2P (Government to Partners): The type of relationship that exists in associative or network governance models between government and partners or stakeholders, and vice versa.

Life Events: This term is a way to classify information and services in government Web sites that refer to those moments in people's lives when there exists more need for information and service. For example, moving, dealing with crime; having a baby, etc.

Networked Governance Model: Each and every part is essential to build up the network, where unions, SMEs, civil and cultural organizations, universities, ICT enterprises, can be found. Some networks work interconnected with others. The government works as a strong coordinator, although it is not the only one.

Technological Model: The technological model incorporates ICT without changing bureaucratic engineering, in the belief that incorporation itself should improve public management. The political level considered makes no decision in regard to e-government; therefore, ICT development is delegated to I.T. experts.

Scale of Impact: General size of the target audience and its geographical spread.

ENDNOTES

[1]   See Key Terms

[2]   It should be taken into account that portals may change their URL as well as their contents. They may also disappear, as in the case with www.estado.cl.

Electronic Government in Small Island States

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INTRODUCTION

The capabilities provided through electronic government (e-government) opens up the potential for government's worldwide to improve the services they offer to their citizens. However, a move towards e-government offers particular advantages to developing countries, especially to small island states. Small island states are typically scattered over a wide geographic area, posing unique problems for their governments in coordinating and delivering services to their citizens. Information and communication technologies (ICT) now make it possible to connect a citizen of the remotest island directly to central government services. This article investigates the role of e-government in small countries. The island states of the South Pacific[1] have been selected as a case study. Though every small island state has its own particular characteristics, the island nations of the South Pacific exhibit such diversity in terms of culture, language, economic activity and ethnicity as to make this region an ideal laboratory in which to observe developments in e-government. The island states of the South Pacific generally exhibit a low population density, which can be an advantage, as ICT-based strategies can be implemented more quickly than in a larger country. However, a small population often means a lack of appropriate skills to implement such policies (Comnet-IT, 2002).

Before the status of e-government can be assessed it is necessary to gauge how ready a society is to benefit from recent developments in ICT. This is generally done by carrying out an e-readiness assessment, which measures a country's ability to take advantage of the Internet and other information and communication technologies as an engine of economic growth (GIPI, 2001). An e-readiness assessment looks at infrastructure, the accessibility of ICT to the population at large, and the effect of the legal and regulatory framework on ICT use. An e-readiness assessment can be useful in the development of e-government by providing benchmarks for comparison and gauging progress.

A survey of the e-readiness of five South Pacific countries (Purcell & Toland, 2004) shows that, with the exception of New Caledonia, these countries are a long way from being e-ready, with little use of IT in businesses, schools or homes; teledensities of 10% or less; Internet penetration of less than 5%; relatively expensive dial-up connection charges (e.g., U.S. $31.00 for 10 hours in Fiji as of 2002); and with a single monopolistic telecommunications provider. Another recent survey carried out for UNESCO (Zwimpfer, 2002) confirms this, reporting that less than 25% of the South Pacific population use a computer for any purpose.

Despite the bleak picture painted by these statistics, there are some positive aspects: AUSAid statistics indicate that the population is well educated, with a high level of literacy; that English is the main business language in most countries; that all countries are included in the global telecommunications network, and many countries have recently upgraded their telecommunications infrastructure. This means that if the technology became more affordable and suitable training was introduced, the development of e-government could accelerate quickly.

E-government should not be viewed as an uncomplicated transfer of IT tools and concepts developed in the private sector into the public sector. The public sector is a law-based system, and government covers many processes that are different from processes encountered in private sector settings such as retail or banking, for example: complex decision making; negotiations between stakeholders; policy formulation; and democratic participation (Lenk, 2002). An example: the issue of land ownership is contentious in the South Pacific, and the use of e-government could help land boards to demonstrate a fair and transparent approach to this issue.

BACKGROUND

E-government is more than just technology. It provides a new kind of service delivery function for government organisations. Several traditional government functions, such as publishing, information gathering, business transactions, and data search and retrieval, are combined into a single form of presentation. In the past the use of ICT in the public sector generally consisted of batch processing of mass transactions using a mainframe computer. Recent developments, particularly applications of the Internet including e-mail and the world-wide Web, have now eliminated the constraints of geography, and time, with far reaching consequences.

A distinction should be made between public sector usage of ICT generally, and specific e-government initiatives. E-government is the subset of public information technology, which involves the delivery of government services and information to citizens (Howle Schelin, 2003). E-government includes two separate areas. First, it is concerned with changing internal government operations, inasmuch as information technology is used to support cooperation among government agencies. Second, it is used to support external government operations, in particular the interactions between citizens and companies, and the public sector, on a self-service basis. E-government is not only concerned with using more IT in the public sector; it is also key to supporting governments which want to become more strategic in their use of IT (Gronlund, 2002). Gronlund suggests E-government involves using IT to:

1. Provide easy access to government information and services to citizens and business;

2. Increase the quality of services, by increased speed, and process efficiency;

3. Give citizens opportunities to participate in democratic processes.

Though the focus of e-government is often on external services, it is also important to use these technologies to make the internal services more efficient (Gronlund, 2002). The traditional bureaucratic model of public service delivery has highlighted specialisation, departmentalisation, and standardisation resulting in individual departments adopting a "silo" mentality and resisting cooperation across agency boundaries. Recent developments have seen governments adopting a more citizen-centred approach, which emphasises both internal and external collaboration (Ho, 2002).

Figure 1 shows the basic elements and relations in a democratic government system. The arrows indicate influence. Each node in the system influences both of the others through a number of relationships. The potential ICT systems that can be used to facilitate coordination between formal politics, administration, and civil society are shown. These systems aim to improve the internal workings of administration by cutting process costs, and managing process performance. They address the problems of government being too costly, too inefficient, too inconvenient, and too self-serving (Heeks, 1999).

E-government applies to both national and local government. The adoption of ICT is often driven by national governments, which have access to more resources and are more aware of international trends. In contrast, local governments are closer to their communities, and as such may be more aware of the practicalities involved in facilitating a citizen's access to e-government.

Figure 1. Examples of ICT uses in e-government (Source: Gronlund, 2002)
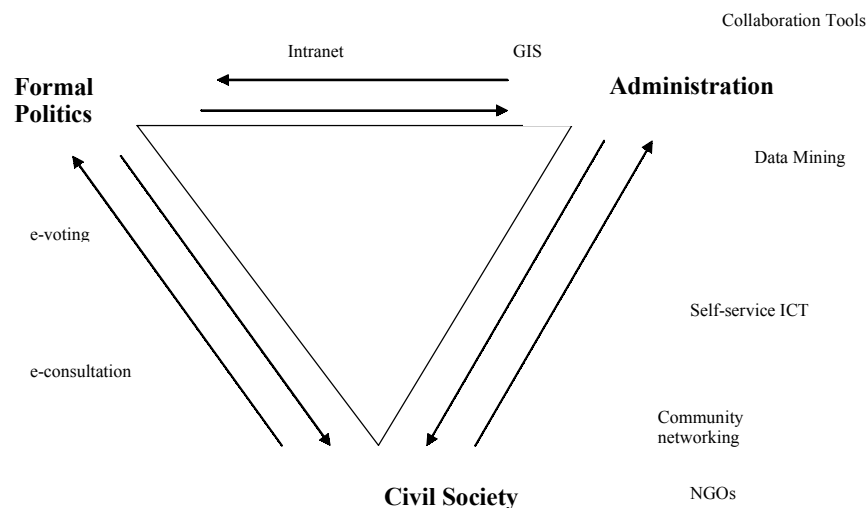
Table 1. UN-ASPA five stages of e-government (Adapted from UN & ASPA, 2001)

STAGE	DESCRIPTION	SPECIFIC FEATURES
Stage One	**Emerging Web Presence** Static information on the government is provided	Postal Address Email Address FAQs
Stage Two	**Enhanced Web Presence** Information is kept up to date, some documents can be downloaded	Updated regularly Search function Newsletters
Stage Three	**Interactive Web Presence** Citizens can search databases, and submit online forms	Downloadable forms Specialised databases Discussion Forum
Stage Four	**Transactional Web Presence** Transactions can be completed online, and sites are fully secure	Public user log on Online Payment Security Policy
Stage Five	**Fully Integrated Web Presence** A single customisable portal provides all services and links	Portal Complete information

South Pacific island states' governments can use the Internet to assist with public sector operations. For example, ICT can provide governments with increased capacity to collect revenue from fishing, forestry, agriculture, and tourism. The use of an Intranet enables different government departments to share information easily. This facilitates a greater degree of cooperation among government departments.

A number of organisations have developed frameworks that can be used to track the development of e-government (Jupp, 2003). The UN/ASPA five-stage model, shown in Table 1, is particularly appropriate for developing countries.

The model tracks a country's e-government progress. A stage one e-government presence (Web site) will be a basic public information source, often developed by employees of the agency rather than professional Web developers. At stage two the Web site will be regularly updated, some documents will be available for download, and e-mail will be available for queries and comments. Once stage three is reached, the government Web site begins to act as a portal with links to related sites, both government and non-government. At stage four, citizens will be able to complete transactions online, and Web sites will be secure. Stage five occurs when there is an integrated countrywide portal where all services offered by government can be offered through one integrated "one stop shop" site (Lallana et al., 2002).

In the case of Samoa, most government departments now have Web sites (Purcell, 2002). However they are generally still at stage one of the model and are limited to advertising and information sharing only. Like other Pacific countries, government departments in Samoa use the Internet mainly for email. The technology has not yet begun to contribute to efficient and effective procurement, as it does now with governments in developed countries.

EMPIRICAL STUDY

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To find out where South Pacific countries were on the UN-APSA model, and to assess the opportunities for, and barriers to progress, an exploratory study was carried out. This involved surveying attendees at a 2002 conference[2] on ICT use in the Pacific region about their use of email and the Internet. In parallel with this, a number of government Web sites from Fiji, Samoa, and Vanuatu were sampled for evidence of features derived from the UN-APSA model.

The attendees at the conference came from 10 different South Pacific countries. Some respondents worked directly for their countries' governments, while others worked for NGOs or telecommunications companies. The instrument used was an anonymous questionnaire, which queried the respondents' use of email within the government, and between government and its external clients. Twenty individual respondents completed the questionnaire. Respondents were asked whether their own organisations had Web pages, and what they used their government's Web pages for. Respondents were also asked to estimate what percentage of their clients had access to email and the Internet. This was to confirm the information already collected about e-readiness, by establishing what access citizens had to ICT either as individuals in their own right, or through NGOs that might lobby on their behalf. In terms of the development of e-government, we sought to investigate communications between governments and organisations such as schools, NGOs, and utility companies. The survey was followed up with an open ended discussion in which focussed on the barriers, threats and opportunities stemming from e-government.

FINDINGS

Figure 2 shows that the most common method used to communicate between a government department and an individual citizen is still face to face discussion. The reasons given for this were that it was the most suitable method for lengthy discussions, that people felt comfortable with it, and that it was seen as the best way to achieve results. Those who picked email as their first choice method appreciated the speed and convenience it offers.

Respondents were asked to estimate what percentage of their external clients had access to the Internet. The findings confirm the results of the earlier UNESCO study (Zwimpfer, 2002), with the majority estimating that less than 25% of their clients had access to the Internet. However the feeling was that this number was increasing in the urban areas, and there was quite a wide variation from country to country.

Figure 2. Most frequent method used to contact government departments
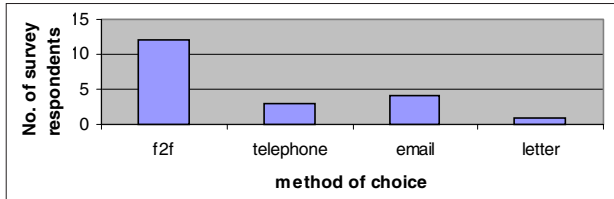
Figure 3. Estimated percentage of external clients with access to Internet
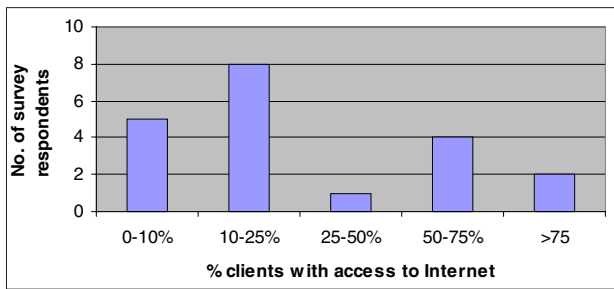
Seventy-five percent of the respondents worked for an organisation that had its own Web site. Most were regular users of government Web sites, with only two people reporting that they never used such Web sites. The most frequent uses of government Web sites were for general browsing, looking up contact details, downloading documents and sending emails. None of the participants had ever made a payment using a government Web site.

The sampling of selected government Web sites confirmed these findings. Most sites featured documents to download, contact details for government departments, and FAQs (sites answering "frequently asked questions"). The more sophisticated sites also featured up-to-date news feeds, and search facilities. None of the sites sampled had online forms, featured portals, or included any facility for online transactions. Most of the sites were at stage one of the UN-APSA model (emerging Web presence), with a few at stage two (enhanced Web presence).

As a follow-up to the questionnaire, 26 conference participants from 12 different countries discussed the barriers, threats and opportunities to e-government. The main points submitted are summarised in Table 2. The higher rows of the table show the most frequently mentioned issues, and the numbers in brackets refer to the number of participants citing that item as a concern.

The major barrier to e-government was felt to be a lack of commitment from the governments of the respective

Table 2. E-government: Barriers, threats and opportunities

BARRIERS	THREATS	OPPORTUNITIES
Lack of commitment from government/ decision makers (9)	Security issues (3)	Improve transparency (6)
Lack of awareness of the benefits (8)	Could foster corruption (3)	Will be cost efficient/ cheaper (5)
Poor telecommunications infrastructure (8)	Use of ICT could replace jobs (2)	Will improve access to information for general public (5)
Lack of skills & knowledge (4)	Availability of sensitive materials (2)	Pacific people living overseas will have easy access to information (3)
High costs of hardware & telecommunications access (4)	Loss of income for telecommunications companies (2)	
Lack of regulations & policies (3)		
Monopoly for telecommunication companies (2)		

countries. Respondents felt that the governments did not view e-government as an important issue. The poor telecommunications infrastructure, and a lack of awareness of the benefits, are also key barriers. The participants saw the main opportunities being offered by e-government as being improved transparency, better access for the general public, and cost-saving.

FUTURE TRENDS

A number of Pacific island countries have a history of political instability, with the result that many citizens distrust their government. E-government is a tool that can be used to help build trust by making interactions between citizens and government more transparent, and reducing the possibilities for corruption. e-government can help to transform government to be more citizen-centered, and to improve services to citizens. Information technology is a crucial driver of these improved services (The Working Group, 2002).

As well as developing a shared vision with their citizens, governments need to develop partnerships with private businesses in order to move forward. For example, a major barrier to the development of online payment in Pacific island countries is the lack of a clearing house for the validation of credit cards. The Samoan government is offering incentives to the private sector to develop a central payment clearing system, which could be used by all Pacific island countries.

A key issue in establishing ICT connectivity between small islands is affordability. Travel in these countries

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is expensive often involving a combination of bus and boat journeys, therefore although sending an email may be relatively expensive, the cost compares very favourably with the cost of a journey to the nearest government office. A long journey can be undertaken to reach the nearest telephone, only to find that the official you want to contact is out of the office. In the Solomon Islands ICT infrastructure is being rolled out using Wi-Fi. Solomon Islanders are finding that email is a more economic communication option than the post, telephone, or face to face meetings; the more remote the island, the greater the benefit. Developments in wireless technology open up the possibility of providing access to e-government without the development of costly infrastructure (Caldow, 2003). Obviously the purchase of such equipment would be beyond the budget of the average citizen of a developing country, but communal resources can be created. In Brazil, trucks equipped with computing equipment travel to deliver government services to more than 400 rural communities in Bahia state (The Working Group, 2003). Just as dentists currently travel from island to island by boat, mobile technology could also travel from island to island, opening up access to government resources for remote citizens.

CONCLUSION

The findings show that Web sites and email are quite common in the public sector in the South Pacific, though there is little transactive use. The survey showed that the main opportunity offered by e-government to the South Pacific would be increased transparency. The major barriers were the low priority it was given by government, and the poor telecommunications infrastructure. The potential of e-government for the South Pacific is recognised by those involved in ICT development. Though Internet usage is relatively low, the potential is there for e-government applications to develop if government commitment is forthcoming.

Though it is useful to compare findings against an internationally agreed model, such as the UN-APSA model, what is important is not what stage of the model a country is at, but whether it is delivering services to its citizens in a manner they find satisfactory. Our findings show that online communications between government and NGOs are reasonably developed, and given the collective nature of South Pacific society it may be more effective to develop a model of e-government where an individual citizen's access to government is through an NGO acting as a facilitator, rather than aiming for direct government to citizen access.

Before e-government can be fully developed and implemented, there is an urgent need for developing countries

of the South Pacific to develop a national ICT strategic plan to ensure that any ICT development-including e-government-is aligned to the country's overall national strategic goals. A number of South Pacific organisations have joined forces to form the CROP ICT working group; together they have developed an overall strategic plan for the region (CROP, 2002). The plan has four guiding principles: up skill human resources; develop infrastructure; facilitate cooperation between stakeholders and improve policies and regulations. The development of an appropriate telecommunications infrastructure is a particular challenge for small island states, due to the low population density, and the vast distances to be covered. The goal is to open up regulatory frameworks to allow competition, and encourage private sector participation in infrastructure development. With the cooperation of regional governments, and the private sector, this goal could be achieved within two years, resulting in lower prices, and a greater penetration of services. Forming networks with other countries can enhance a country's technological knowledge, helping to counterbalance resource limitations it may have (Bureaus, 2001). This idea of an ICT alliance is particularly relevant to small Pacific island states. National ICT strategic plans can most effectively be developed and implemented by drawing upon partnerships among organisations, and collaboration among people across organisational borders.

Decision makers in South Pacific countries must be made aware of the benefits of e-government. In particular, they should understand that e-government can be a driving force to re-engineer and transform governance, and to provide better for the needs of the country's citizens.

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KEY TERMS

E-Government: The application of information technology by public sector organisations to provide services and information to individuals and business organizations.

E-Readiness: A measurement of how ready a society is to benefit from recent developments in ICT. An e-readiness assessment normally takes into account education levels, infrastructure, the accessibility of ICT, and legal and regulatory issues.

FAQs: Frequently asked questions

ICT Alliance: A partnership between two or more nation states to share knowledge and resources in the area of ICT developments.

NGO: Non-government organisation, a private non-profit making body, which operates independently of government. NGOs normally provide various forms of social services or community development.

Portal: A multifunctional Web site that forms a gateway to a range of services that usually includes Web directories, search capabilities, and links to other Web resources.

Silo: Used to describe the situation where a section of an organisation has become insular, and does not share information with the rest of the organisation. Communication tends to move up and down within the silo, rather than horizontally across silo boundaries.

Teledensity: The number of telephones per 100 people in a region.

WiFi: Wireless fidelity technology allows devices to connect to the Internet without the need for landlines. WiFi enabled computers can send and receive data from anywhere within the range of their base station.

ENDNOTES

[1] The scope of this research covers the small South Pacific Islands of Melanesia and Polynesia, namely: American Samoa; Cook Islands; Fiji; Kiribati; Marshall Islands; Nauru; New Caledonia; Niue; Samoa; Solomon Islands; Tokelau; Tonga; Tuvalu and Vanuatu

[2] APT/PITA Regional ICT Workshop for the Pacific, Nadi, Fiji, 11-13 November 2002

E

E–Mail as a Teaching Supplement in Tunisia

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INTRODUCTION

Learning and knowledge dissemination using Information and Communication Technologies (ICT) is becoming increasingly prevalent in schools and universities around the world. Most institutions of higher learning now invest heavily in technologies such as the web and e-mail for students, staff, and faculty. ICT use is set to rise in emerging countries eager to move towards an "information society" where learning and knowledge are accessible to all.

Using ICT as a teaching supplement has become such a phenomenon that there are presently more than 10 millions online courses worldwide. The Massachusetts Institute of Technology is considered a pioneer in making available course material not only to its students but also to the world at large and aims to offer free nearly all of its 2000 courses online by 2010.

Several teachers have made judicious use of e-mail as a teaching supplement (Carlton et al., 1998; Richards & Keppell, 1997; Scarce, 1997). Scarce (1997) observed that most students had a positive attitude towards the use of e-mail in a classroom setting even at the beginning of the course and thought that e-mail should enhance their learning experience. Carlton et al. (1998) also described an experiment in which they placed online versions of their course slide presentations on the Internet. They noticed that the added convenience of having courses available day and night was an incentive for students to use the Internet.

This article reports on an experiment conducted at the Higher Institute of Management[1] over three consecutive years and involved the use of e-mail for communicating with and distributing lecture notes to students enrolled in an elective course.

THE SITUATION IN TUNISIA

Shortly after its independence in 1956, Tunisia, the smallest country in North Africa with less than 10 million people, knew that it had little choice but to open up to the global market.

In 1995, Tunisia was one of the few Arab and African nations to become a member of the World Trade Organization (WTO) and the first country along the Southern Mediterranean coast to sign an association agreement with the European Union. The Tunisian government is well aware that globalization and modernity are intertwined and that modernity is linked to education and ICT. Like other Arab countries, Tunisia needs to close a "growing knowledge gap" by investing heavily in education and promoting open intellectual inquiry (UNDP, 2003). Actions to popularize ICT as a tool for knowledge acquisition should focus on boosting computer and Internet literacy and using ICT as a tool for life-long learning.

Education

According to the World Bank, Tunisia's investment in education is one of the highest in the world; it spends 25% of its annual budget on education and training–a critical factor in its economic growth and progress. Essentially in Tunisia, education is free to all and mandatory for girls and boys until age 15. School enrollment (6 to 12 years) is 91%. The literacy rate is presently equal to 68.3%.

English is mandatory from seventh grade to university. Internet access is available in all universities and secondary schools. As a consequence of the rapid devel-

Figure 1. The evolution of the numbers of teachers and registered students in Tunisia and corresponding student/teacher ratio between 1990 and 2009 (Source: Tunisian Ministry of Higher Education, Scientific Research and Technology, www.mes.tn)
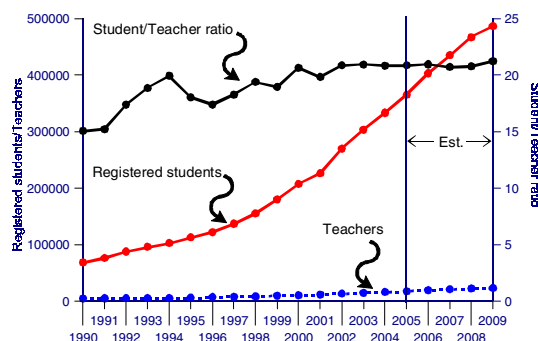
opment of the education agenda, the number of students has nearly quadrupled over the last thirteen years from 68,000 in 1990 to more than 262,000 in 2003; the growing number of new students is expected to exceed 400,000 by 2006 (see Figure 1).

Education is strategically important as it has a role to play in preparing future knowledge workers to think globally, to acquire the skills necessary to use ICT, but also to acquire the culture that this entails, especially in a region where people are believed to prefer the spoken over the written and the written over the electronic[2].

Unfortunately, the current space and infrastructure are no longer sufficient to accommodate these increasing numbers of students[3]. The incorporation of computer technology in education has become a necessity in teaching and has subsequently been a growing trend in elementary, secondary, and higher education for the past few years. As a result, 10% of primary schools and all secondary schools and universities have access to the Internet[4]. Faculty and students represent 12% of all Internet users and 16% of all Internet subscribers (February, 2004).

Technology

Tunisia is considered a pioneer among Arab countries with a clear strategy towards ICT. It was the first to connect to BITNET in 1989, the first to connect to the Internet in 1991, the first to enact a law for the general organization of electronic exchanges and electronic commerce in August 2000, and it will host the second phase of the World Summit on the Information Society (WSIS) in 2005.

The number of Internet subscribers has increased from 30,000 in 1999 to more than 95,000 in February 2004 resulting in 631000 "Internautes". Over the same period, the cost of making telephone calls continued to drop while the number of people with access to telecommunications facilities increased relentlessly. Because of these developments, Tunisia has often been touted as a model emerging economy (Newsweek, 2003).

The nationwide effort has also been accompanied by two programs that are of relevance to the experiment described in this article. The first, launched in 1998, is the progressive generalization of the use of the Internet through public Internet access centers equivalent to cyber cafés called "publinets". In 2001, there were 181 publinets scattered around the country; at the time of publication they numbered 305.

The second is the Family PC program, launched in April 2001, to allow families and individuals to acquire a multimedia PC and a printer for less than TD 1,000[5]. Loans were also made available for this purpose. Nine

months after the launch of the program, 23.000 PC were acquired by Tunisian households.

Distance learning has become so important in Tunisia that the objective of the 10th Social and Economic Development Plan (2002-2006) is that 20% of the courses offered in universities be delivered digitally by 2006. If the Web and multimedia are to be used in distance learning, e-mail will remain one of the first and most widely used technologies because of its ease of use and relative simplicity.

THE ICT COURSE

Because advances in the accessibility of ICT mean that it is now open to use by non computer specialists. The ICT course was intended for fourth year (undergraduate) students in Marketing, Entrepreneurship and Management. It is one of the last courses that these students attend, optionally, before they graduate and either join the job market or pursue graduate studies.

The Course

From 2001 to 2003, the course was offered three hours a week. From the outset, students were briefed about the course's nature and the fact that use of e-mail was mandatory for distribution of course material. Use of e-mail was also encouraged for asking questions and communicating with the teacher. Securing an e-mail account was therefore required and students were asked to communicate their e-mail address electronically as soon as possible[6] after enrollment. Particular emphasis was put on the fact that part of the evaluation was to be made on the Internet and that students who would not register their e-mail address with the teacher would not receive the instructions for the test and therefore would not be allowed to take it. This was done several times over the semester. In 2003, students were even given an explicit deadline and were told that all should register by the fifth week.

The Students

At the beginning of the course, students were asked to provide information about whether they had access to a PC, to the Internet, to e-mail, etc. Their distribution and characteristics are as given in Table 1.

As can be seen in Table 1, ICT penetration percentages were highest in 2002. The fact that 25% of the students had never used the Internet before came as a surprise in 2001. Even though this percentage decreased to 10% in 2001 and increased again in 2003 (22%), the fact that students close to graduation have never used the

Table 1. Characteristics of the students enrolled in the NICT course

Year	Own a PC at home		Have already used the Internet		Already have an e-mail address		Total no. of students enrolled
2001	61	40%	114	75%	105	69%	153
2002	79	63%	113	90%	99	79%	125
2003	52	51%	79	78%	22[1]	22%	102

[1]. Have access to the Internet from home.

Internet was worrisome. However, the Family PC program launched in April 2001 may have contributed to the increase, from 40% to 63%, of students owning or having access to a PC at home. But this percentage dropped in 2003.

Note that students have at least three ways to access the Internet: (1) from home (see Table 1), (2) from the computer center of the Institute, or (3) from publinets; there are 28 publinets in the vicinity of the capital. Almost no student was an Internet subscriber and all but one had Web mail accounts such as Yahoo and Hotmail.

The Course Materials

Specifically designed to increase computer and technology literacy amongst students, the ICT course covers such materials as organizational information systems, organizational uses of ICT (ERP, CRM, SCM, Intranet, EDI, etc.), communication (e-mail, Extranets, groupware Web, Internet, etc.), and new organizational design made possible through advances in technology (the integrated enterprise, the extended enterprise, the network enterprise, etc.).

The course materials, first divided into three parts in 2001 then in four parts in the following years, were distributed electronically through successive mailings to students having communicated their address to the teacher. This was the only means by which students would secure the materials from the teacher.

The Registration Process

In 2001, the first time that ISG students were introduced to this medium as a teaching supplement, registrations were very slow. Figure 2a shows that it took 56 calendar days for the 105 students who already had an e-mail address to send it to the teacher. In 2002 (Figure 2b), registrations started out very quickly compared with 2001. Though registrations were performed faster in 2002, the 99 students who already had an e-mail account prior to joining the course did not register until the 53rd day of the semester. In 2003, (Figure 2c), it took seven days for the 22 students who had Internet access from home to send their e-mail addresses in.

In Figures 2a-2c, the dashed lines indicate the daily number of registrations received. Note that the number of messages received in one day peaked at 16 in 2001, nine in 2002 and 19 in 2003. The 19 messages were received immediately after the deadline was announced.

Though these peaks were observed during the first weeks of classes, there seems to be no correlation between the sending of the lecture notes and the rate of e-mail registration. A cursory look at Figure 2 suggests no association between the milestone dates in Table 2 and the rate of registration. The same trend was observed in 2001 and 2003. In fact, we first thought that statements made in class by the teacher had more effect and some students checked their e-mail only when they

Table 2. Milestone dates for the communications emanating from the teacher (2002)

Date	Observation	% registration
Feb. 20	Mailing of Part I of the lecture notes	58%
Mar. 18	Mailing of Part II	78%
Apr. 2	Mailing of Part III	82%
Apr. 11	Mailing of the instructions for the in-class test to be held on April 17, 2002	89%
Apr. 17	In-class written exam	96%
Apr. 26	Mailing of Part IV	96%
Apr. 28	Mailing of the instructions for the test to be conducted on the Internet (April 28-May6)	96%
May 13-15	Oral exams	98%

Figure 2a. Daily and cumulative numbers of student e-mail registrations over the 2001 Spring semester. (The dashed vertical lines represent the mailing of Parts I through III of the lecture notes.)
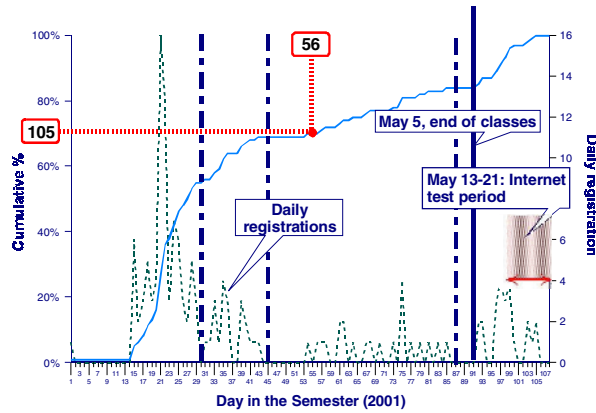
Figure 2b. Daily and cumulative numbers of student e-mail registrations over the 2002 Spring semester. Here the highest number of daily messages received was 9.
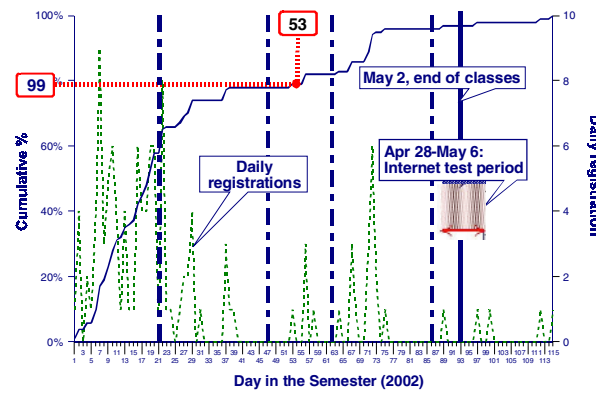
Figure 2c. Daily and cumulative numbers of student e-mail registrations over the 2003 Spring semester. The highest number of daily messages received was 19.
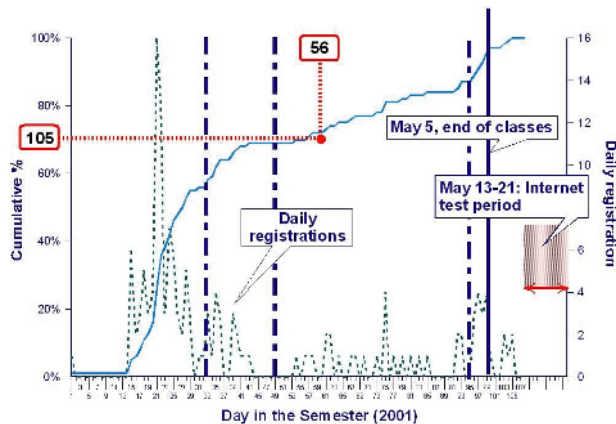
were told that they were sent a message. Because this was not done in 2003, an alternative explanation became more evident: students' registration messages flow in more frequently around class meeting times because that was when those who have no PC at home and no access to a publinet were more likely to use the Institute's computer center facilities. The scheduling of the Internet test prior to the end of classes in 2002 and 2003 did not affect the rate of registrations. Students were still sending their e-mail addresses even during the test.

The Internet Test

In this test, a different task was given to each student. One of the questions provided key words which the student was asked to use to find the Web page of a Tunisian company and to describe the strategy used to find the site. The objective was not really to find the site but to devise a correct search strategy and to describe it logically based on what was taught in class.

DISCUSSION

The data collected about messages sent and received revealed several phenomena related to the use of e-mail by university students. Two will be discussed in this article. First, students were slow at revealing their e-mail address even when asked with insistence. Second, on the average, students were faster at registering their e-mail address year after year (see Figure 3).

Each of these issues will be addressed in the following subsections.

The Slow Registration Rate

The low speed at which students registered their e-mail address could perhaps be explained by the novelty of the request since some of them had never used e-mail and those who did never associated it with school work. This is apparent in Figure 2a, where the curve starts flat with only one student registering his e-mail address from day one.

Figure 3. Comparisons between the cumulative numbers of student e-mail registrations (2001-2002-2003)
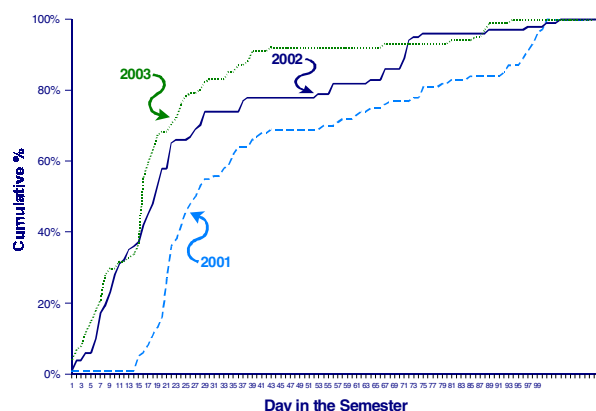
Is it likely that the slow speed is associated with a lack of enthusiasm on the part of students? This would be reminiscent of results obtained in MacKinlay (1999) whose students would use e-mail only in emergencies (sickness and delays in handing in homework) but contrary to observations made by Scarce (1997) about students' enthusiasm regarding e-mail.

The slow reaction of some students could also be explained by the difficulty that they may encounter in securing an e-mail address not knowing what to do, where, and how, even though these issues were covered in class. It would have been easier for them if the Institute had assigned an e-mail account to each student at registration or during their orientation, for example. This is common practice in other universities (see Scarce, 1997 for an example)[7].

One would have expected students to be more diligent in light of the teacher's insistence and the availability of lecture notes only by e-mail. Surprisingly, this was not enough and, in some cases, students were still registering even after the course had ended.

The Relatively Faster Registration Rate Year After Year

The slight increase in speed as compared to 2001 may be due to the possibility that successive generations could be more likely to have had more experience with computer technology. It could also be due to more insistence on the part of the professor. However, results obtained by Thomas et al. (1998) challenged the assumption that younger students are more acquainted with technology. Besides, given the short period of time, this is highly unlikely.

A more plausible explanation may be that 2002 and 2003 students were already told in advance by their peers what to expect; something 2001 students could not have known since the course was offered for the first time that year. Following this reasoning, registration rate should be even faster in 2003 but the fact that a deadline was given only that year may have been another reason why registrations were faster.

CONCLUSION

This article analyses data about e-mail exchanges collected over three years at the ISG. Dealing with the introduction of the use of e-mail as a medium of communication between the teacher and his students, It is also more of a description of adoption of a technology in a setting that has introduced ICT in its curriculum but not in its culture since e-mail has never been fully suggested, let alone adopted, as a teaching supplement in Tunisia, yet.

Preliminary observations allow us to hypothesize that adoption was slow in a country which aims at integrating online technologies into the classroom, adopting distance learning and which has already launched several e-learning programs and even a virtual university.

The passage of a country to an information society and subsequently to a knowledge society depends among other things, on the will of its youth to adopt ICT and to at least be computer literate. Because the vocation of the ISG is to produce future managers, the significance of the ICT course was based upon the belief that every future professional needs familiarity with computer and communication technologies. Acquiring new skills and being literate and proficient in a simple medium such as e-mail is an absolute minimum. Yet, despite the fact that the course was clearly about ICT and its use, and that it was optional, difficulties have been observed in the adoption of such a technology by fourth year students. The root of these difficulties may be cultural since learning e-mail is, in itself, straightforward: oftentimes, it is the first Internet application students learn (Richards & Keppell, 1997). But reflexes such as checking e-mail regularly do not seem to be easy to acquire. Even students already owning PCs at home, having access to the Internet and having e-mail addresses did not check their e-mail regularly; most only did this when the teacher advised them that lecture notes have been dispatched.

Availability of computers and cost of access cannot be serious explanations for students' apparent resistance to secure an e-mail address or to communicate it to the teacher since both could come at no cost at the Institute's computer center. However, the fact that computer support was scarcely available in those facilities

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did not help in building students' confidence; therefore, they did not feel encouraged to try this new medium on their own unless obliged to do so.

As Partee (1996) pointed out, e-mail should not be considered an alternative to face-to-face student-teacher interaction. Like other communication technologies (newsgroups, chat rooms, etc.), e-mail should be considered a supplement, an extension at best, of personal instruction. Thus, if in a given culture, face-to-face the interaction flows from the teacher to the student and rarely in the opposite direction, it should come as no surprise that IT remains neutral in that respect.

Finally, the fact that ICT could be used as a teaching supplement does not necessarily mean that it should be introduced piecemeal. We used e-mail only to communicate with students and to dispatch lecture notes but all other aspects of the course remained traditional "face to face". This might be another reason why students did not behave as expected.

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KEY TERMS

Distance Learning: A mode of learning whereby teachers and learners are not necessarily in the same location. Knowledge acquisition is said to be asynchronous when the production and acquisition of knowledge are not performed simultaneously.

E-Mail: The exchange of notes through electronic means, generally, but not necessarily over the Internet.

Family PC Program: A program launched in Tunisia in April 2001 to help households acquire PC and printers at a total cost of 1000 TD (US$700).

Information and Communication Technology (ICT) in Teaching: Hardware, software, networks and services related to the use and operation of equipment in the preparation and diffusion of courseware and to communication between teachers and students, including communication between teachers and between students by electronic means.

Web: A part of the Internet where documents and other resources as accessible through hyperlinks. Using the Web for teaching materials diffusion places the onus on the student to download files.

ENDNOTES

[1] Institut Supérieur de Gestion (ISG) de Tunis.
[2] The first press appeared in Tunisia in 1860 (AbiFarès, 2001).
[3] In 2000, twelve new higher learning institutions were created bringing the total number to 107. Nineteen more were created two years later.
[4] ATI (Tunisian Agency for Internet), www.ati.tn/Internet, accessed on April 21, 2004.
[5] 1 TD (Tunisian Dinar)=$0.7.

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6 We will refer to the process of students communicating their e-mail address to the teacher as "e-mail registration" in the remainder of this article. E-mail registration messages sent by the students are therefore messages containing only the identity and class group of the student.

7 This practice was commonplace at several US universities (Texas A&M University, University of Pittsburgh, etc.) back in 1990.

Employability Management of ICT Professionals

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INTRODUCTION

The article describes work conducted as part of the Indic@tor project funded by the European Commission (IST-2000-31070) and supported by the Netherlands Organization for Scientific Research (NWO) (Aspasia program 015.000.114). The study examines the employability of ICT professionals and its management by small- and medium-sized enterprises (SMEs) in Europe against the backdrop of the expanding but turbulent ICT sector. Employability can be defined as the extent to which employees have skills that the market and employers regard as attractive. The development of technical and professional workers is an area of high priority for governments concerned with creating an adequate supply of skilled labour and fuelling economic growth, while for SMEs, there is general concern about the supply and utilisation of ICT skills, high turnover of experienced staff, and the under supply of qualified new entrants into the profession (Cappelli, 2001; Hill & Stewart, 1999; ITNTO/AISS, 1999).

Employability has gained in importance as the nature of employment and work patterns, particularly in knowledge-intensive industries, has changed. Discontinuous forms of employment, such as temporary contracts and increasing subcontracting, mean that employers are viewed increasingly as providers of the necessary knowledge and skills which enhance employability rather than secure employment (Arthur, Inkson & Pringle, 1999; Cappelli, 1999).

This highlights a tension between the role that should be played by organizations and individual employees in continuously updating knowledge and skills to enhance professional development. Employers generally do not take full responsibility for eliminating perceived skill gaps in their companies either through strategies for retaining highly qualified staff or through the provision of expensive training, mentoring or other development strategies. They may be reluctant to invest in the development of skills that make their employees more marketable while employees themselves may develop expertise that is too narrow to stay employable in the long run and keep up with technological and scientific developments.

Highly qualified employees may also face declining re-employability when entering later stages of their career (Boerlijst, Munnichs & Van der Heijden, 1998; Van der Heijden, 2002). The consideration of age-related issues in career development is relatively recent (see also, Hall, 2002) but there is growing concern about guiding individuals' professional development throughout their working life facilitating life-long learning approaches (see, for example, Kwakman et al., 2002). Given the aging and dejuvenization of the working population (i.e., the increasing proportion of older people coupled with decreasing proportions of young people in the labour force) and the tendency for older employees, working in middle and higher-level functions, to become immobile and overspecialized in narrow occupational domains, the need to ensure employability throughout the working career is apparent. Yet, the extent to which either management or employees themselves are actively engaged in furtherance of the professional career noticeably declines when the employees age. The consequences may be serious for older employees whose function becomes obsolete and who are unable to adapt to changing requirements.

OBJECTIVES

Despite the increasing importance of employability for governments, employers and employees, there has been little scientific study of how employability is acquired by individuals and how it can be developed and sustained over the life cycle of a career, especially in the relatively new ICT sector and for smaller employers with limited resources. The present study attempts to address this gap by examining employability of ICT professionals in different European countries and the management of employability by ICT SMEs. This contribution has three objectives:

1. To examine the nature of employment in the ICT sector in seven European countries (Germany, Greece, Italy, the Netherlands, Norway, Poland, and the UK), each of which is expected to represent different employment conditions for ICT professionals.
2. To explore the perceptions of ICT SME employers in these countries with regard to the importance of employability for their organizations and their concerns in attempting to manage this quality of employees.
3. To consider the implications of the study findings for sustaining employability across Europe, particularly in terms of the expected role of SME employers and the development of professional expertise through all career stages.

METHODOLOGY

The empirical focus involves two analyses, one using secondary data sources and the other based on qualitative interviews of ICT SME managers. First, an analysis of the ICT sector in the seven countries based on cross-national and national data sources provides a summary of the key features of the ICT sector, including its contribution to economic growth, and a description of the high-skilled ICT workforce (e.g., demographic characteristics, labour market supply and demand for ICT professionals, and the nature of companies employing ICT professionals). The seven countries were chosen largely on the basis of convenience sampling (based on well-established relationships between research institutes) while also aiming to represent the ICT sector in Europe. They represent five different clusters within the European Community; the Netherlands and Germany (Germanic Cluster), UK (Anglo-Saxon cluster), Norway (Nordic Cluster), Poland (Eastern European Cluster), Greece (Near-East Cluster), and Italy (Latin Cluster).

The second analysis involved interviews with a selected group of managing directors, CEOs or managers in ICT SMEs who were representative of the population of ICT companies identified in the sector analysis. This was intended to explore employers' understanding of occupational expertise of ICT professionals, and the extent of practice addressing employability issues (e.g., dealing with skills gaps, performance assessment, or career planning). Interviews were conducted in all seven countries from April 2002 to February 2003 and aimed for five companies in each of three SME size bands: 10-49 employees, 50-149 employees, and 150-249 employees. A common semi-structured interview protocol was used covering three themes: employability, aging and future developments and requirements. The final number of inter-

Table 1. Number of interviews conducted by SME size

Country	Number of employees			
	10 – 49	50 – 149	150 – 249	Total
Germany	3	7	5	15
Greece	13	2	0	15
The Netherlands	10	2	3	15
Norway	5	5	5	15
Italy	10	3	2	15
Poland	6	6	6	18
United Kingdom	8	5	1	14
Total	55	30	22	107

views conducted was 107; numbers by company size in each country are shown in Table 1.

All final interview transcriptions were analyzed at a national level by researchers in each country according to a common coding scheme. This was constructed on the basis of three Dutch interviews by subdividing the data into core labels (variable categories) representing each of the three interview themes, dimensions of these core labels, and loadings (Baarda, De Goede, & Teunissen, 1995). For example, the core label employability included the dimension 'employability management'. A loading represents a group of similar statements given by respondents that are indicative of a certain dimension. Researchers at the national level were able to add additional categories to this general framework for each item. Comparable answering patterns were aggregated in the cross-cultural analysis to produce an overall frequency table of responses.

RESULTS

The ICT Market in the Seven Countries

The European Information Technology Observatory's (EITO) 2003 overview of the ICT sector across Europe shows a picture of rapid growth during the 1990s and decline since 2000. Market evaluations for 2002-2003 indicated zero growth in Europe in 2002 and the prospect of limited development in 2003 (growth of 2.5%) (EITO, 2003). However, there is expected to be a strong growth in Internet penetration and broadband connections (DSL and cable). This has led the EITO to forecast 3.1% growth in the total ICT market for Western Europe in 2004 with some segments of the market, particularly software products and carrier services, showing stronger performance (EITO Update, 2003).

Comparisons across the seven countries showed key differences in the development and distribution of ICT activity. At the high end of development, the UK and Germany represent the largest IT software and services markets in Europe. In 2000, the UK contributed 9% and Germany 6% of the overall OECD ICT sector employment (by comparison, amongst OECD countries, only the U.S. and Japan have higher country shares on both measures) (OECD, 2003). They also represent a sizable proportion of Europe's overall employment in high technology (Laafia, 1999). Growth in the ICT sector for both countries is currently around 10% per annum, and they each employ close to one million people.

Italy is the fourth largest ICT market in Europe (after Germany, UK and France) with a growth rate of 12% per annum. It is ranked sixth in terms of OECD share of ICT employment (after the U.S., Japan, the UK, Germany and France) and fifth in terms of country share to the total OECD value added of the ICT sector (after the U.S., Japan, Germany and the UK). It employed over 700,000 people in around 108,000 companies.

The ICT sector in the Netherlands, although representing only 1.2% of the OECD's total ICT sector value added and 1.6% of total OECD ICT employment, has seen a rapid growth in terms of its contribution to the national economy, with contribution to GDP growing from 9% to 13% between 1996 and 1998. In 2000, the sector employed almost 270,000 people in around 27,000 companies.

Norway is a small ICT market relative to other countries in the project, employing around 84,000 people in 10,000 enterprises, but in 2001 the ICT sector grew 7.7% from 2000. This represented 4% of total employment and 6% of the economy. Norwegian ICT employment and value added are dominated by consultancy services that accounted for 45% of all employment in the ICT sector in 2001 and unlike the other industries within the ICT sector showed significant growth between 1995 and 2001.

Poland saw rapid growth, exceeding 22%, in its ICT sector through the 1990s that began to retrench in 2000 falling to 8%. The value of the Polish computer market was estimated at $2,500,000 in 2000 rising by around 10% from 1999. This largely reflects the deteriorating economic situation and slower rate of development of the Polish economy in general.

Finally, although Greece has the smallest market in our sample of countries (the ICT sector accounts for over 4% of Greece's GDP and experienced a 9.4% growth rate in 2002) there is a faster rate of growth in telecommunications. The Greek telecommunications market (which includes telecom services, equipment, and systems) is driven by the recent expansion in mobile telephony and deregulation of the industry. The ICT industry in Greece is expected to grow about 5.6% in 2004.

The ICT Professional Workforce

In all countries, ICT professionals, defined here as ICT practitioners whose job involves "designing, developing, producing, installing, managing, maintaining or supporting systems for other people to use" (CEPIS, 2002), are employed by both ICT-suppliers (i.e., organizations whose primary purpose is IT supply) and ICT-users (i.e., organizations whose primary business is in another sector of the economy, such as telecommunications and manufacturing of radio, TV and communications equipment). There is a strong emphasis on ICT services in all countries, with the majority of enterprises classified in "Computer and Related Activities" and "Other ICT services" according to Revision 3 of the International Standard Industrial Classification (ISIC). The sub sector "Software consultancy and supply" accounts for approximately 40% of all ICT employment in Italy, the Netherlands, Norway and the UK. Combined with other ICT services, over half of employment is in ICT services. Only in Germany does ICT manufacturing comprise a relatively larger share of total ICT employment.

With respect to ICT professionals themselves, common job titles are application developers, technical developers, software engineers or computer analyst/programmers. The rate of growth in high-skilled ICT-related workers has been greater in Germany, the Netherlands and the UK. The EU average of high-skilled ICT workers as a proportion of total employment was 1.7%. This compares to the highest share of high-skilled ICT workers that was in the Netherlands (3.2%) and the lowest that was in Greece (0.6%). The demographic profile of ICT professionals suggests a common pattern across all countries; this group is more likely to be male (approximately 70% across the seven countries), ages between 25 and 40 (again over 70%, although software engineers tend to be even younger), and better qualified than the workforce as a whole (i.e., more likely to be university graduates, particularly in computer science).

Labour Market Demand and Supply

The increased activity in the ICT sector during the 1990s, partly due to liberalization of the telecommunications sector, the authorization of new mobile telephone providers, and the level of Internet and new media diffusion, has resulted in an increased demand for labour with ICT skills in both ICT supplier sectors and end-user sectors (European Union, 2001). Since 2000, however, there has been a considerable retraction, as is evident in the analysis for all countries. There is also a gap between the skills of current and future workers and the needs of firms. Studies carried out by International Data Corporation

estimated skill demands and shortages in the EU-15 countries, Norway and Switzerland. ICT skill shortages in particular areas (Internet-related activities, IT-supported business activities and host-based, distributed and applications environments) were expected to reach 13% of total demand in 2003 (IDC, 2000). The demand for these ICT specialists was found to vary across countries, being particularly high in the Netherlands, where ICT has one of the highest weights in total employment, and low in Greece, where supply and demand are more balanced. The skill shortage in the UK was just above the Western European average, while the level of skill shortage for Norway, Germany and Italy was below the average.

Policy responses to shortfalls in supply of ICT specialists do vary between countries, particularly in the role played by higher education, and the impact on ICT recruitment and training policies. While employers may look towards government to respond, for example, by expanding the supply of labour from higher education, as is the case in the UK (Steedman, Wagner & Foreman, 2003), one implication of the present study is to consider the role of employers in generating a larger pool of highly-skilled ICT employees (e.g., through work-based training and development). This issue is addressed further in the report on the qualitative study that has been performed in the final discussion with respect to employability.

Analysis of ICT SME Needs

Our interviews show, in general, that most ICT managers have an interest in employability matters concerning the whole organization. However, attention is often ad hoc due to the influence of the market in the ICT sector. It is this that tends to dictate the required competences for ICT professionals (see also Willis & Dubin, 1990). Flexibility is needed in order to maintain adequate accreditation for new software and as a result strategies tend to be ad hoc to fit with current demands. This was especially the case for the small SMEs (10-49 employees) in our sample who were faced with situations of economic uncertainty.

Ten respondents overall stated that they undertook no activities in the area of employability management; in Norway and Greece, there was no mention of such activity at all. Where it is present, employability management tends to be directed toward assessment and development plans (reported by over two-thirds of respondents) mainly in order to keep ICT professionals up-to-date. One Polish manager in a medium-sized SME mentioned the importance of "creating and maintaining a family culture"; others in Poland mentioned "providing literature and attending conferences". Norwegian and Polish managers tended toward performance appraisals; British, Polish and Greek managers mentioned mentoring; evaluations with employees and customers were named by 14 manag-

ers from the UK, the Netherlands, and Italy; and the "provision of funds for education" was mentioned especially in Greece (15% of all respondents; 81% Greek). SMEs with 10-49 employees emphasized career planning (although not in Poland or Greece) and almost a third of the respondents (again not in Poland and Greece) "discussed and assessed employees' functions."

Responsibility for employability matters tended to rest with the director/management team, the human resource manager, or the manager of the department concerned, although 10 respondents (mainly Polish, Norwegian, and British managers) stated that this rests with the employees themselves. Management also tries to enhance employees' commitment towards the organization and to a lesser degree to optimize the full utilization and development of competences.

Aging and dejuvenization of the population did not cause any problems for the SMEs in this sample. Confirming the relatively young profile identified in the industry analysis, ICT professionals were found to function at senior levels, for example, as managers or directors of SMEs at around 35 years of age. Seniority was related more to competences that match the requirements of the market. Almost half the respondents (and all from Germany) stated that aging and dejuvenization was not expected to cause problems for their organization because the age structure is, and is likely to stay, young or has a pyramid shape. One quarter of respondents (none in Poland) stated that knowledge and experience are more important than age and only a small number of Norwegian, German, and Polish managers foresaw such problems.

The present and future effects of the economic depression were mentioned by most ICT managers, and survival, especially for SMEs, was a major issue. Some companies where interviews were conducted have already gone bankrupt. Technological developments have meant that updating of technical knowledge and expertise, as well as communication and consultancy competences has become more significant. Yet, this is unaffordable in times of crisis. Nevertheless, ICT professionals have to be flexible generalists often without the help of real organizational structures to stimulate and maintain learning. For the majority, these issues, as well as the problems of combating and/or preventing skill "obsolescence" or of increased demand for ICT professionals, were not priorities.

In short, the analysis found that, although there is an interest in employability matters among SME ICT managers, actual policy and action lag behind. In this respect, the current economic depression and the developmental stage of the ICT sector in each participating country have a strong impact. As such, the development of ICT professionals' employability is not a top priority, but a luxury item on which little time and effort is spent.

Implications for the Management of Employability of ICT Professionals

Despite management interest in their workforces' employability, there was little evidence of action to stimulate employees' further growth and development, flexibility or versatility in any of the participating countries. Our analysis of the state of the ICT sector provides a strong indication of why this may be the case; the economic slowdown affecting the ICT sector since 2001 has meant a considerably less dynamic labour market for ICT professionals compared to the 1990s, implying less competition for skilled professionals and simultaneously fewer resources for companies to invest in developing their own employees.

Despite the difficult economic conditions, our sector analysis also shows that there are continuing skills shortages in some areas (primarily Internet-related activities, IT-supported business activities and host-based, distributed and applications environments). The demand for such ICT specialists is especially acute in the Netherlands, and less of a problem in Germany, Greece, Italy and Norway. Nevertheless, this shows that technological developments are still likely to dictate the required competences of ICT suppliers and hence require continuous updating of technical knowledge in key areas of the market. Moreover, amongst the small ICT suppliers who make up the majority of the sector in all countries, we found that managers consistently identified "soft" skills, such as communication, flexibility, team working and consultancy competencies, as important for dealing with client service interactions in addition to technical software or systems development skills.

The interviews suggest that SME managers and employers in all countries, while acknowledging the importance of this range of competencies for the survival of their companies, consider it unaffordable to invest in developing their employees in this way in times of crisis. They seemed unconcerned with formally gathering data on existing levels of competence or with taking strategic action to prevent "obsolescence" and meet expected future needs.

Such a short-termist, instrumental approach to managing employees characterizes well the increasingly temporary nature of employment relationships that, as we have seen, has been intensely felt in the volatile ICT sector. The need for rapid reaction times may also preclude managers from more strategic planning. They also may be unwilling to enhance the employability of their employees if they are likely to take these new skills elsewhere. Yet, a sizeable proportion of managers across our seven countries also mentioned the importance of employee commitment to the organization, especially in a depressed market when an SME's survival may depend on

specific expertise possessed by one or two individuals. Some writers have argued that employees, in fact, are more likely to commit themselves to an organization that invests in broader competence development and enables career development and professional growth (Gaspersz & Ott, 1996).

The existence of a human resource specialist may increase the chances of companies developing career programmes for their employees or of being aware of development issues, but for SMEs, a separate HR function is rare. The present results showed that it is more often the managing director or line managers who take responsibility for performance assessment and development. This is consistent with literature that describes smaller firms' competence development and acquisition as improvised and informal (see also Hendry, Arthur & Jones, 1995).

Overall, the majority of managers interviewed claimed that promotions were based on possession of competence in areas driven by market-need and this was not age-related. It may be that the more direct communication and flatter hierarchy possible in SMEs means that managers are less likely to be led by age stereotypes than in larger organizations with more formal hierarchies.

Business Benefits

The findings show that managers in ICT SMEs take an informal and ad hoc approach to the employability of their employees, despite the pressures imposed simply to survive in a highly competitive and, at present, depressed market. To be more precise, most managers indicated that they have an interest in employability matters.

By investing in the employability of their present personnel, many authors have argued that companies can facilitate the flexible deployment of staff and provide a binding force for ICT practitioners who may be more likely to remain in organizations where they can keep learning and where their market value is sustained. Investing in existing staff also improves the recruiting power of the organization, making it more attractive for potential employees. This is a critical feature in tightening labour markets (see also Van der Heijden, 2002).

Aging as a problem for employability was not yet recognized in the majority of our interviews. In the relatively young ICT sector, however, it is possible that aging of the workforce will present a challenge in the future for ensuring and promoting the employment of people over 40, as this group was acknowledged by some to be less likely to possess the required adaptability in technical competence required in the ICT sector.

Thus, changing career direction or acquiring new competencies is to be expected in the dynamic ICT

sector, where reorganizations or market changes are frequent. Employees whose acquired expertise is focused in a single area will be left aside in such shifts. Individuals may have to increasingly accept responsibility for their skills development and marketability; however, management also would benefit from ensuring that highly-qualified employees remain committed to their companies.

CONCLUSION

Despite the diversity in the ICT sectors represented by the seven countries in the present study, interviews with managers of SME ICT companies revealed remarkable similarity in the concerns expressed with respect to issues of employability. SMEs in all countries, from the well-developed markets in the UK and Germany, to the emerging Polish ICT sector and tiny Greek market, expressed concern with their own survival in the current economic conditions. There also was a general interest in attracting and keeping ICT professionals with key technical and general consultancy skills, but a relative absence of formal management systems for optimizing the competencies of their existing employees in the form of enhanced employability. Employee development practice and strategy in these ICT SMEs tended to be ad hoc, informal and short-termist.

The study aimed to fill a gap in HRM research generally with respect to SMEs as most HRM recommendations are based on studies conducted in large firms (see also Deshpande & Golhar, 1994; Legge, 1995). Moreover, there has been little research on expertise and employability in the ICT industry, especially with respect to the role of management rather than other stakeholders, such as government and higher education, in expanding the supply of skilled workers. In addition to identifying the general lack of SME management contribution to employability enhancement, this study addresses debates that individuals are increasingly expected to take responsibility for their skills development and marketability. While the article confirms the relatively hands-off approach of management, the identification of continuing skill gaps and the potential resurgence of the ICT sector from 2004 suggests that ICT SMEs also would benefit from ensuring that highly-qualified employees remain both employable and committed to their companies.

Preliminary outcomes of the Indic@tor project, of which this study was a part, provide further insight into the status quo regarding the management of employability and occupational expertise of ICT professionals. A large-scale quantitative survey will examine the relationship between individual, job-related and organizational factors and their effect on the development of employability. This will show differences in managerial and employability practices across the seven countries, leading to practical recommendations for stimulating the career development of ICT professionals.

Despite the rapidly increasing globalization of business and industry, there is a serious lack of cross-national and cross-cultural comparative social science research to provide guidance for career management practice. This partly can be attributed to the lack of global constructs and theories, the complexity of measuring country-level effects, and the difficulties of cross-cultural research design. The Indic@tor study aims to address this gap and will be reported in both professional and scientific publications in the near future.

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KEY TERMS

Aging and Dejuvenization of the Working Population: The increasing proportion of older people coupled with decreasing proportions of young people in the labour force.

Career: A sequence of work-related positions occupied by a person during a life-time (Hall, 2002).

Employability: The extent to which employees have skills that the market and employers regard as attractive.

ICT Professionals: ICT practitioners whose job involves "designing, developing, producing, installing, managing, maintaining or supporting systems for other people to use" (CEPIS, 2002) are employed by both *ICT-suppliers* (i.e., organizations whose primary purpose is IT supply) and *ICT-users* (i.e., organizations whose primary business is in another sector of the economy, such as telecommunications and manufacturing of radio, TV and communications equipment).

The Indic@tor Project: A cross-cultural study on the measurement and enhancement of employability among ICT professionals working in small and medium-sized enterprises. Project ID: IST-2000-31070/European Commission, Information Society Technologies.

Professional Competence: The ability to function effectively in the tasks considered essential within a given profession (Willis & Dubin, 1990, p. 3).

Small and Medium-Sized Enterprises: Enterprises which have fewer than 250 employees, a yearly turnover of less than 40 million Euro or a balance of less than 27 million Euro, and less than 25% of their capital or voting rights in the ownership of a non-SME (EU Recommendation of the 3rd of April, 1996).

Establishing a "Knowledge Network" of Local and Regional Development Subjects

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INTRODUCTION

Efficiency of collective action, aimed at social development, in many ways depends on the level of being well-informed and the intensiveness of knowledge sharing between the social agents, which are the professional corporate communities in this domain. Modern information technologies allow influencing the social development by establishing of Internet networks for geographically separated social agents who collaborate on the basis of "horizontal" communications. From this point of view, the Internet can be considered a catalyst of inter-group communication and an instrument for decentralized projection of social development. There has been no sociological research conducted in Ukraine to find out the efficiency level of cooperation between social agents using an Internet network to share information and knowledge concerning local and regional development. But even a general overview of the Ukrainian Internet shows an unsatisfactory state of such cooperation. Indirectly, this is proved by the data regarding the Internet content for 2002, which demonstrates that scientific research and educational organizations represented only 4.4% of the Internet content (Bryzhko, , Tsymbaliuk, Orekhov, & Galchenko, 2002, p. 101). We have all the grounds to state that computer databases existing in Ukraine do not meet the requirements of the local and regional development. Further, they do not contribute sufficiently to the professional growth and development of the professional communities' ethical standards.

In the present situation, the environment for virtual information is one of the effective mechanisms enabling global changes on all levels of social modernization—international, national, regional, and local. As a result, this mechanism has to become an element of special public information policy and a key factor of strategy-building activity of social agents who act in the sphere of local and regional development. Thus it is suggested that the following elements of information processes need to be revisited:

a. information (knowledge);
b. type of communication, setting the modes of behavior in the information space; and

c. type of social agents (participants) that form the value and goal structure of the information space.

These components in whole should give us an answer about the possibility of effective information interaction in the sphere of local and regional development in general but particularly relevant to the Ukraine.

As one of the resources, information is also an object of separation, and in this sense it is an object of information policy. In the purely administrative aspect, this last concept for the most part is interpreted as trends and methods of independent institutional objects—a state, its individual agencies, bodies of local self-governance, organizations, and institutions dealing with information collection, dissemination, and storage. The purely administrative context of information policy, in spite of wide variety of tasks that should be accomplished in the course of this activity, consists of the quantitative monitoring of information flow. Judgment about information openness and closeness of an information policy object are made on the basis of quantitative assessment of information flow index. In this perspective, information stands as an object of information policy. This orientation of the government authority's activity has achieved some success, which is demonstrated in particular by the establishment and functioning of the unified Government Web Portal and the setting into operation of the new communication trunk and zonal fiber-optical lines. The issue of information "electronic governance" systems and their implementation into public administration (E-Government) is also being developed (Klimenko & Litvinov, 2003), as well as variants aimed at broadening the possibilities of public access to the Internet. Further, the number of local self-governance bodies using the Internet for managerial purposes and for ensuring transparency of their work is gradually extending (Baiev, 2003). This gives us the ground to assert that the State of Ukraine, in the purely technical perspective, has the primary characteristics of an Information Society. The technological basis available allows a large information array of the activities of central, regional and local authorities, to become available for a wide circle of societal users.

However, the situation with regard to the control functions over the effectiveness of information is differ-

ent. This task is a more difficult one for the subject of information policy. A useful information policy has to implement its policy in such a way that allows particular information to reach an appointed target group and results in an expected effect. In such circumstance, the task group (social agent) becomes an object of information activity, while information develops a meaning of an administration influence tool. From that standpoint, information should be viewed as a complex of information measures, which are aimed at changing behavior and attitude towards the knowledge of certain social groups. These measures create possibilities of extending the sphere of power of the state through methods of civil influence that, according to the Declaration of the World Summit on the Information Society, also include information methods (The World Summit on the Information Society, 10-12 December 2003, Geneva, Switzerland, http://www.e-ukraine.com.ua/viewnews/press/31). The efficiency of such work can't be evaluated quantitatively, but only on the basis of the successful functioning of such social agents (corporate professional groups) on social development. This orientation (task) of information policy becomes especially significant when the matter concerns social agents, whose activity takes place outside the bounds of administrative subordination to the public authorities. In this case the concept of authority influence (Gavrilov, 2003) can be used, meaning that activity of government agencies is aimed at the dynamics of their relations with social agents, where the elements of public administration are absent.

CONFIGURATION OF INFORMATION AND COMMUNICATION SYSTEM OF LOCAL AND REGIONAL DEVELOPMENT

In every stage of social development, a state has to determine and regulate at a legislative level those societal elements and interrelations which serve its strategic goals (Atamanchuk, 2003). This state function becomes more important under conditions of market-driven economies in a pluralistic society. If social agents are not administratively subject to the state, only legislative and information tools through administrative influence can be used. Because of this, they (objects of information influence) will maintain their vital social activity, at the same time serving the purposes of social development. At the declarative level, the Ukraine government agency has already defined the subjects of local and regional development. Associations of local self-government bodies and their unions, as well as agencies of local and regional development are recognized as institutional subjects. The

regulation of the legal status of associations and other voluntary unions of local self-government bodies is outlined in the bill, "On local self-governance in Ukraine." The government has also prepared a draft Law of Ukraine "On the principles of regional development stimulation," which provides for creation of the Regional Development Agencies Network.

This conception of regional policy and the above-mentioned bills override any other structures, which one way or another are the agencies of local and regional development. Also included in this list are state regional training, retraining and excellence centers for managers of local government institutions and municipal companies, non-governmental training institutions[1], scientific institutions—academic institutes, universities, branch research institutes, state research organizations that execute the orders of budget and private organizations, "brain centers"—non-governmental research institutions specializing in the sphere of local self-governance; consulting firms and other similar institutions; information and analytical editions covering the matters of local and regional development. The potential of individual social agents should not be disregarded and these include—employees of local public institutions, working in the information and analytical divisions, subdivisions of local development; a certain part of state employees, who create information products concerning local and regional development[2]. Some experts working in this field can act effectively expressing interests of larger elements of development infrastructure.

The groups listed above represent the configuration of an information and communication system of local and regional development, which is now spontaneously forming on the Internet without any external coordinating influence. This effort allows the observation of the processes of growth and self-organization of this system, which promotes engaging people and organizations into information bonds of various societal levels. Some of the agents of local and regional development are already involved on the Internet and in the analytical centers networks of Ukraine in particular (Analytical Centers of Ukraine Network, http://www.intellect.org.). This process lacks systematic character and coordination from the point of view of the creation of information resources. Most of the organizations involved function separately one from another. There is not enough information about their particular specializations and the market for consulting services. They don't have a clear idea of the experience and work results of each other, while institutions of local government receive scanty information about existence and consulting possibilities from many of them. Hence the unique experiences, document packages, knowledge, which are formed by every agent, remain untapped for the purposes of cohesive social devel-

opment. Thus the conditions for synergetic effect as a result of combined activity of separate social agents of local and regional development have not been created.

It seems sensible to adopt an approach that makes use of ICT itself to solve this problem. The optimal way of addressing this can be found in creating information resources as a classified knowledge system, accessible for agents of local and regional development and other users regardless of their geographical location. Such networks to satisfy the needs of professional and special interest groups already exist in the developed countries. Many of these are known as "knowledge networks" because they meet the needs in information and knowledge exchange. Palmer and Richards (1999) are convinced that creation of new knowledge in the future will occur not in the frameworks of separate organizations, but in such knowledge networks. However, there is another point of view, asserting that significance of the Internet is exaggerated by commercial organizations for the sake of publicity. There is good reason to lean toward a positive estimation of network cooperation because it neither cancels nor changes the traditional forms of information and knowledge exchange. It reinforces the effect of the creation of new ideas, accelerates the formation processes of the social idea, and provides transparency and accessibility.

There are some useful examples of successful international information networks, designed for professional and civic groups. The SIGMA Program (Support of Public Administration Improvement in the Countries of Central and Eastern Europe), which is a knowledge network has been created in 13 countries to support public administration reform. SIGMA provides network members with access to experienced specialists in the field of public administration, comparative information and technical knowledge related to the Public Administration Service. It provides material and the technical basis for establishment of a knowledge network between the subjects of state administration in Central and Eastern Europe, as well as between them and their colleagues in other countries (SIGMA Program, http://www.oecd.org/puma/sigmaweb). An information and knowledge base concerning local and regional development is located in the LOGIN (The Local Government information network) international network. This program which has functioned since 1999, is engaged in accumulating, processing and distribution of information and knowledge, designed for the needs of local self-governance (of local and regional development) through the Internet. Through a simple interface at the program's Web site, any user can learn about member organizations, to get in touch with them and receive current information on communication events, training programs, etc. (The Local Government information network, http://www.logincee.org.) The library fund, containing 2,000 documents on the different fields of action of local self-

governance bodies, is a knowledge network of this program.

The availability of an international network doesn't remove the necessity of the need for the creation of similar national Ukrainian network. Especially because the access to the LOGIN library fund demands knowledge of one of three languages: English, French or German. The Cities and Communities Association of Ukraine, which has recently become a LOGIN Program partner and is creating its own library fund, doesn't provide for the needs of an expert. However addressing the problems of the Ukraine is not limited to the creation of a knowledge network. Mavko (2003), analyzing methodological principles of regional strategies in Ukraine, indicates that successful strategic planning for regional development in the Ukraine also requires the establishment of an institution of professional strategic planning consultants. The author of this article believes that it is necessary to form a municipal consulting institute with larger functions, which should be included into the wider context of system reforms covering administrative, administrative-territorial, municipal reforms, and the context of national regional policy. Together with other factors, creation of information network of local and regional development is an effective means of forming this socially important institution.

Information Stratification and Structure of Information Resources of a Local and Regional Development Network

The relevance of the content of information resources is determined by the field of their use. Therefore, it is considered useful to distinguish between scientific, social, economic, political, legal and other types of information. All of these in one way or another deal with local and regional development. However, generalised knowledge cannot be taken as an absolute truth in the information space. Knowledge is always subjective, because it depends upon the context of social agent activity and on its cognitive abilities. In this sense, information is a raw material transforming into knowledge as a result of its independent search and analysis. That knowledge, in turn, is a foundation for autonomous decision making according to specific problems and activity of a social agent. For better understanding of such an approach to knowledge it is recognized that some information better resembles a real phenomenon having specific characteristics (Berger & Lukman, 1995). Indeed, any information has meaning of cognitive construction only if it is interpreted as reflection of a real existing phenomenon. Therefore formation of an interactive communication orientation in local and regional network will depend firstly, on

the sense of one's presence in the information space as an equal communication partner, and secondly, on a creative and constructive attitude towards the information coupled with a high level of confidence in its author.

Every social agent, depending on his specialization, is using certain components of the information resources for creating the new knowledge. These are not new for a society in a general sense but are new for the developed knowledge. There should be information reflective of all agents' views on local and regional development in the network. The information resource related to a general destination should include knowledge determining the motivational dynamics of the social agents institutional behavior and constructions of their social roles in the context of particular local and regional development paradigms based upon their own decisions. The process of role distribution, which should be understood as an habitualization process, is of great importance for network cooperation, since it should result in connecting knowledge to specific activity types (typification). Playing roles and making decisions requires specific knowledge of specific situations, understanding of connections between goals and methods of their achievement. Thanks to typification and specification of knowledge of independent social agents, desegregation into components of local and regional development problems and goals then takes place. In that aspect we can question the necessity of social agents information stratification inside the network community.

Information stratification is a necessary component of network cooperation, since the creation of local and regional development information resources anticipates a lot of mental work and the elaboration of new knowledge in the form of models, algorithms, programs or projects of solving certain problems, etc. That can be achieved only by common efforts. A state has a particular role to play in the creation of information resources, presented on the Internet, as a social development coordination center. The Ukraine only has one Legislative Act determining the state position regarding the Internet use for the purpose of social development. This is the Decree of the President of Ukraine, formulating the basic tasks of development of the national constituency of the Internet and providing a wide access to it (http://www.president.gov.ua/officdocuments/officdecrees/101228133.html). However it doesn't include the legal requirements of Web-page content of any executive authority, or use of the Internet for organizing problem discussions and draft resolutions. But nevertheless, it guarantees the state support of the infrastructure development for delivering information services through the Internet. The creation of electronic resources of local and regional development on competi-

tive basis could become a part of such state support. The strategy of carrying out competitive projects is already worked through in the context of Ukrainian-wide contests for local self-government development projects and programs, which were established in 2003. According to the Conception of National Electronic Information Resources Formation, created information resources should become available in this way (http://www.kmu.gov.ua/z1/portal/search).

From the point of view of a general approach to defining the structure of local and regional development information resources, the following basic positions can be distinguished. It consists of:

a. Analytical analysis on national policy in the field of local and regional development, its primary problems and priority guidelines (constitutive and prediction knowledge);
b. Information on informative and consultative abilities of local and regional development subjects, scale of their activity, specialization, experience, and personnel; and
c. Innovation funding of local and regional development (best practices, methods of problem solving, etc.).

More detailed structuring requires further research. In conclusion, I would like to mention that the classification used in the context of information stratification for professional network entities implies distinguishing basic, advanced, and innovative knowledge. The above-mentioned classification is acceptable for knowledge networks of local and regional development, though it should be reinterpreted. This subject can be bounded by the establishing principles that should be followed in the course of network collaboration and creation of information resources, and which can be viewed as the conclusion to the above-stated material. These should include the principles of:

1. Partnership, to define interactive communication type in the virtual space;
2. Trust, to ensure implementation of the interactive communication type;
3. Information resource positioning, to ensure good user targeting;
4. Objectivity, to convert information into knowledge adequate to actual problems;
5. Integration, to build an integrated information resource on key problems of local and regional development; and
6. Optimal information volume.

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E

KEY TERMS

Habitualization: The process of assimilation of certain social practices. Using the term "habitus" has longstanding traditions in the European socio-philosophical discourse. Berger and Lukman use the term because of its polysemy. "Habitus" can take on the meaning of habit, custom, inclination, development pattern (biol.), and so on.

Information and Communication System of Local and Regional Development: A system that combines all the subjects on the basis of common principles to realize information and communication interaction for local and regional development.

Information Process: The process of information products' creation, collection, processing, accumulating, storage, search, dissemination, and use.

Information Resources of Local and Regional Development: An organized entity of information products, which are created and disseminated for local and regional development needs.

Information Space: The aggregate of all determined objects, subjects and information ties between them, which function and interact to provide for information needs of people, professional corporate communities, subject of local self-governance, region, society and state.

Information Stratification: The role distribution between the information interaction objects according to the amounts and types of information products, the creation of which is based on specialization in a specific activity sphere and on its scale.

Knowledge Network: The conventional name for an information and communication system, the framework of which includes information interaction and mutually beneficial collaboration of corporate professional groups for the purpose of information and knowledge exchange.

Municipal Consulting: The system (institution) and type of management consulting, the objects of which are the subjects of municipal scope of activity. A separate form of municipal consulting is giving consultations regarding issues of local and regional development. In the Ukraine, municipal consulting as a social institution is at the formation stage.

National Information Policy: The aggregate of basic trends and methods of the state activities, involving the information collection, storage, usage and dissemination.

Social agent of Local and Regional Development: The corporate professional structure working in the field of local and regional development. the meaning of the notion of "agent" indicates the fact of independent determination by this structure of the strategy of its activity.

ENDNOTES

[1] In the framework of the Community Partnership Program, five training centers operate in Donetsk, Lviv, Kharkiv, Kherson, and Cherkasy, which are financed by the "Ukraine – USA" Foundation. These centers provide consulting services to the bodies of local self-government, with the training itself being only one of the forms of consulting activity.

[2] Consultations and other information products concerning some issues of local self-government activities are provided by: the Department for Contacts with Local Authorities and Local Government Institutions of the Verkhovna Rada of Ukraine, Central Administration for the Public Service of Ukraine, Department of Regional Policy of the Ministry of Economy and the European Integration of Ukraine, Department on Contacts with Local Authorities of the Secretariat of the Cabinet of Ministers of Ukraine, Assistance to the Local Government in Ukraine Fund of the President of Ukraine.

Expanding E–Commerce into E–Ducation

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BACKGROUND

The fall of the Soviet Union created a series of new economic situations in Eastern Europe. Soviet-style Communism quickly gave way to a radical and unbridled form of capitalism that led many outsiders to refer to the region as the "wild East" (Pei, 1994; Brady, 1999; Miller, Grodeland, & Koshechkina, 2001). Over time, business practices began to settle as persons from the former Eastern Bloc focused on Western models of business and finance (Brady, 1999; Mikelonis, 2000; D'Anieri, Kravchuk, & Kuzio, 1999). Such a transition would not be easy, for 75 years of Communist rule left a limited framework upon which individuals could build capitalist-style industries.

As interest in Western business practices grew, so did the degree of online access Eastern Europeans had to ideas and consumers in industrialized nations (IDC Research, 2003; The new geography of the IT industry, 2003). Such access was important, for it allowed persons in these developing nations to connect with the greater global economy and improve the conditions of their businesses and the economies of their regions (Koretz, 2001).

In the summer of 2001, a group of business educators and businesspersons from the United States, Ukraine, and Poland converged in the Ukrainian city of Yalta to participate in two weeklong conferences dedicated to exchanging ideas on business and education. Organized in part by the USAID-sponsored Consortium for the Enhancement of Ukrainian Management Education (CEUME) and the Kyiv Mohyla Business School, the conferences focused on the development of business education programs in Eastern Europe and on helping local businesses become part of the greater global economy. One session within each weeklong conference focused on e-commerce. Participants in these sessions engaged in a dialogue on how the developing economies of the East and the industrialized economies of the West could modify e-commerce perspectives to benefit individuals from both cultures. These discussions included an examination of e-commerce, online education, and connections that could be made between the two. Out of these discussions emerged a hybrid business–education model that used online media to benefit individuals in the developing East and the industrialized West. This article presents the results of those discussions.

AN E-COMMERCE PARTNERSHIP

According to several conference participants from Ukraine, many businesspersons in Ukraine, Poland, and Russia use the Internet to learn about foreign markets. The idea is to gain information about overseas companies in order to work with them as partners or to begin selling products abroad. Unfortunately, as many participants noted, when one is not part of the culture being examined, it can be difficult to conduct Internet-based research effectively. As several participants explained, the situation often becomes one where individuals have the money needed to achieve an e-commerce objective but lack the knowledge required to recognize that end.

At this point, participants from Ukrainian universities noted how this situation was also affecting business education in Eastern Europe. Several individuals indicated that educational institutions in the region often lack funding. As a result, the facilities and equipment available for teaching and research are often insufficient. In most cases, an important source of capital to improve conditions is local businesses, and an obvious means of generating revenue would be to offer training to the employees of these businesses. When it comes to e-commerce, however, local businesses often have better facilities and equipment than those available at nearby universities. The question was then raised, "What do these universities have that can encourage local business investment?" In terms of e-commerce practices, many participants cited that an academic reputation can provide a special kind of access to international markets. The task for these institutions then becomes finding a way to use such a reputation as a means for creating links between East and West. Over the course of the conference sessions, parties from both developing and industrialized nations examined this concept from various perspectives, and a basic model for forging connections began to emerge.

American participants noted that university students in industrialized/Western nations often look for opportunities to study abroad, for courses or credits from overseas institutions can increase a student's marketability upon graduation. Such study, however, can be costly in terms of transportation, living expenses, and lost employment. These factors often mean that many Western students cannot take advantage of such opportunities. What makes this situation particularly interesting is that

these students have direct access to the markets and the cultures businesspersons in developing nations such as Ukraine, Poland, or Russia wish to study. Moreover, because these students are a part of the related culture, they understand its workings in a way that outsiders cannot. The question then becomes can these two parties (businesspersons in developing nations and students in industrialized nations) be brought together in a way that allows both to achieve their goals? The mechanism for realizing this end can be educational institutions in developing nations. To bring these two parties together, such institutions need to create an Internet-based situation that combines educational objectives with business needs.

The key is for universities in developing nations to devise online international business courses or certificate programs designed for students in industrialized nations. The idea would be that students in industrialized nations could gain credit from universities in other countries without having to leave home. Rather, all class interactions and coursework would take place online. If the online courses being offered are international business, marketing, or finance, then universities in developing nations would have a mechanism for linking the needs of local businesses to those of international students.

In this model, representatives from educational institutions in Eastern Europe would meet with local businesspersons and ask those businesspersons what kinds of Internet-based research they need done to help with their international business plans. Educators can then convert these research activities into assignments that require Western students to perform online research addressing the needs of a particular business. For example, businesspersons in developing nations might be interested in how well their product could compete in a particular overseas market. In response, educational institutions in Eastern Europe might conduct an online marketing class in which Western students perform a market analysis comparing products in their own country to those of a business in a particular developing nation (that of the related educational institution). Students would complete such activities and give the educational institution data that could then be shared with local businesses.

Within this system, all classes become "virtual correspondence courses." Instructors in developing nations would put assignments, lectures, and links to online readings on a password-protected Web site for these international classes. Western students would access the site, read the related materials, do the research, and submit the assignment via e-mail. In such a model, Western students would pay for access to these online classes and would get credit or certificates from reputable institutions in Eastern nations. Thus, the student gains international

instruction for a fraction of the traditional costs, while the university or college in the developing nation gets research it knows is of value to local businesses. The educational institution can then sell this information to local businesses, or local businesses can pay an annual "membership fee" that would allow them to shape online courses and to have access to student projects containing e-commerce data. Educational institutions in developing nations can then use the increased revenue generated by both parties (overseas students and local businesspersons) to improve facilities and equipment or to hire new faculty.

The time limits of the sessions prevented participants from exploring these ideas any further than the basic model presented here. Participants, however, left the sessions with a framework that could be revised to address different kinds of educational and business interactions. While general in scope, this model could easily be modified or refined into a system that could work for the benefit of all involved parties and contribute to the economies of the related nations. For these reasons, the author encourages readers to examine this model and its ideas in order to develop approaches for merging educational activities and business practices.

FUTURE TRENDS

While institutions in developing nations are often limited in the technological options they have, certain trends can facilitate the previously discussed method for building relationships with international partners. Online access is increasing rapidly in many developing nations, and this growth is expected to continue over time (St.Amant, 2004; Reuters, 2002; Pastore, 2004; 11 trends, 2004). This expanding access brings with it the ability to connect with previously untapped markets in these regions (Beyond the digital divide, 2004; Hamm, 2004). The prospects of accessing such markets has prompted companies such as Hewlett-Packard to develop online communication technologies for developing nations and to create inexpensive hubs for online access in countries such as India, Ghana, Brazil, and South Africa (Beyond the digital divide, 2004; Hamm, 2004).

Within this context, the highly educated and technology-friendly citizens of Eastern Europe would make these countries the logical next step for such expansion. In fact, the number of individuals going online in Eastern Europe is expected to climb from 17% to 27% by 2006, and Web-based outsourcing activities are expanding in this region (IDC Research, 2003; The new geography of the IT industry, 2003; Hamm, 2004). Should such activities prove profitable, then other organizations are likely to

follow suit, and the result would be a more international online environment. If educational institutions in Eastern Europe can tap into such trends and adopt policies that make them attractive "hubs" for online interactions, they could increase the consulting and the educational value they have both locally and internationally.

Additionally, the adoption of such business-education e-commerce models would occur at a time when many organizations are using a process known as international outsourcing to reduce production costs. In this approach, companies or agencies generally employ online media to exchange information and digital materials with employees located in other countries—primarily developing nations. These employees can perform high-tech tasks, such as software programming, for a fraction of what it would cost in an industrialized nation (The new geography of the IT industry, 2003). The savings such processes yield has prompted many organizations to adopt outsourcing as a part of their business practices. For this reason, individuals and industries in developing nations can benefit from the online education model presented here, for it provides a foundation for working within the international online environment central to outsourcing. Such processes, moreover, might become a matter of necessity in the future.

Demographic trends indicate that the populations of industrialized nations are decreasing, while those of developing nations are growing. Organizations in industrialized nations might therefore find themselves lacking the workers needed to perform certain tasks domestically (Drucker, 2001). The logical solution to this problem would be to use outsourcing models for distributing work to employees in developing nations—a situation already taking place in the IT industry (Lui & Chan, 2003).

Educational institutions in developing nations can benefit from all of these trends by including courses in international outsourcing into their "online curriculum." Such courses would allow Western students and local/Eastern businesspersons to interact in the same online class on international outsourcing. In such a class, both parties would be given group projects to work on, and such projects would mimic actual outsourcing activities (e.g., using online media to develop a software product). Through this approach, participants would learn how to use online media for working with other cultural groups within the context of an international production team. Such training would provide valuable experiences and allow the institution to establish a local and an international reputation for outsourcing training. This reputation could contribute to an institution's ability to procure outside funding to conduct research related to outsourcing practices.

CONCLUSION

An e-commerce partnership can allow businesses and educational institutions in developing nations to thrive, while providing students in industrialized countries with new and affordable educational experiences. It is a win-win approach that allows parties with different needs to form strategic relationships based upon online access. By taking advantage of such opportunities, institutions in developing nations can improve both the quality of education they offer and their ability to attract outside funding. This article has presented a model for pursuing such an objective. While the merged e-commerce and online educational approach examined here is general in nature, its underlying premises have merit and are worthy of further examination. By examining this model further, readers can develop more refined systems for allowing individuals and organizations to participate in the global economy.

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KEY TERMS

Developing Nations: Countries in the process of converting to a capitalist model in which the economy is founded mainly upon manufacturing and service versus agricultural production.

E-Commerce: Practice in which organizations use online media such as Web sites or e-mail to present information to or exchange information with prospective and current clients.

Eastern: Pertaining to the former Communist nations and cultures of Eastern Europe.

Hub: A centralized location where activities or interactions take place.

Industrialized Nations: Countries in which capitalism has long served as the model upon which business practices are based and the economy is founded mainly upon manufacturing and services.

Online: Related to or involving the use of the Internet or the World Wide Web.

Outsourcing: A production practice in which certain tasks or parts of an overall operation are performed by workers who are located in different nations.

Western: Pertaining to the nations and the cultures of Western Europe, the United States, and Canada.

Extended Democratic Space for Citizens' E–Participation

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INTRODUCTION

Having appeared and rapidly developed in all human environments, the computer and telecommunication sphere considerably changed the structure and organization of social institutions and interaction between social actors.

Without national frontiers, free from time pressure and territorial barriers, individuals connecting create network communities, exchange information with each other and all the rest from a virtual world, interact online coordinating their work and everyday life and all together influence social institutions enhancing democratic grounds of society.

Administrative reform of the public sector already realized or under realization in most of developed countries follows the lead taken from private sector conception, of concentration on consumer needs. Therefore, public administration is considered as a process of "public service" delivery to citizens. With information communication technologies implemented in the process of public administration, a new era of *electronic government (e-government)* has started.

What's e-government? For some people, it is an advanced mechanism of public administration service delivery using ICT, "the way public-sector institutions use technology to apply public administration principles and conduct the business of government" (Riley, 2003, p. 3). It is also described as, "the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet, and new media" (Gartner Group, 2000, as cited in Bonham, Seifert & Thorson, 2004, paragraph 2).

Others consider e-government more broadly as, "an Internet-driven activity that improves citizen access to government information, services and expertise to ensure citizen participation in and satisfaction with the governing process" (A Global Survey of E-government, 2002, as cited in Riley, 2003, p. 24).

This article examines the nature and scope of the social changes evoked by the online interaction between citizens and government. It also evaluates the usage of special methods for the creation of extended democratic space for genuine citizens' participation in public life.

As presented in this article the usage of ICT in public administration with citizens-centered applications (*e-democracy techniques*) could create the environment for the appearance of *added social value* evoked by wide public participation in decision-making, increased transparency, efficiency and legitimacy of governance.

BACKGROUND

What is the social nature of the changes in public administration called up with the application of new methods for interaction with citizens in online environment? Whether it's only the advanced instrument of citizens' behavior regulation or advanced type of social relations (new social order), what is the social nature of this change?

Both of the mentioned hypothesizes are covered by the early grown e-democracy concept. Steven Clift (2004), famous activist and e-democracy promoter, defines it as follows: "E-democracy represents the use of information and communication technologies and strategies by democratic actors within political and governance processes of local communities, nations and on the international stage" (p.1).

Some authors describe it using a functional approach: "E-democracy consists of all electronic communication media which give citizens the possibility to make efforts in keeping leaders/politicians responsible for their actions in public sphere. Depending on democracy aspects being promoted, e-democracy can use different technologies for: (1) political process transparency increase; (2) citizens' direct involvement and participation extension; (3) perfection of opinion creation quality through new space revelation for information and discussion" (Evaluation of the Use, 2003, p.10).

While some researchers think e-democracy is a key element of e-government, others consider these notions crucial though not identical to e-government. Brack and Noble (2001) describe e-democracy as the "use of Internet by government, political parties and advocacy groups to provide information, communicate, deliver services or boost participation to generate a more robust debate among citizens." It follows that, "While "e-government" includes information, service and participation compo-

nents, it is generally limited to governmental institutions. E-democratic use of the Internet is broader in nature" (p. 1).

Pippa Norris argues that ICT can increase activity only of those who are active, without touching "the non-participatory, inactive and not interested," and thus deepening the social gap (Norris, 2001, as cited in Riley & Riley, 2003, p. 20).

Tomas and Cathia Riley have another opinion on ICT's potential to favor democratic processes: "technology is only a medium and an engine of new and important tendencies in society, a measure to which they follow new ideas, conceptual constructions including innovations and creativity" (Riley, 2003, p. 6).

The structural changes in society caused by ICT becomes more visible from the "remote sight" by taking into consideration the internal horizontal relations and interaction of social actors inside the civil society. There is a ground for researchers to prove the appearance of a new advanced democracy type with enhanced possibilities for participation in social relations and public administration. Such an approach would include the following components.

Firstly, it is about ICT applications for self-organization and engagement of socially inactive, remote or disabled groups into public life and overcoming a social divide. These are virtual interest groups, e-citizens' communities based on electronic communications, which create an e-democracy climate. ICT can transform human networks into powerful forms of social organization.

The second component is that we are witnessing ongoing transformation of public management. It has been found that with the implementation of ICT, public management structure changes. The vertical hierarchy of public administration experiences transformation into horizontal networks accompanied with the redistribution of power (public functions). The advanced ways of interaction between government, business and citizens have been greatly evolved by the application of ICT.

This favors the possibility of citizens' participation in public life, policy and decision-making processes at local and national levels. Thus citizen direct participation in the political process by using ICT becomes a reality.

PUBLIC E-PARTICIPATION IN DEMOCRATIC PROCESSES

ICT makes citizens' direct participation in the policymaking process possible, unconstrained and more intensive. According to Lenihan (2002), ICT can be used "to *extend public space* in ways that might promote consultation and dialogue and between citizens and their governments. Through such dialogue, citizens and stakeholders might express their views, ideas, explore differences or participate more directly in decision-making, that is, in governance. It could contribute—perhaps very significantly—to the revitalization of democracy and to the strengthening of government legitimacy" (p. 27).

Democracy has proved its extraordinary vitality and stability as a form of governance through centuries. What was less permanent in its long history are the democractic techniques—"specific mechanisms, which transform its essence principles into everyday practice of voting, representation, decision-making, implementation and its observance by citizens and government officials who changed considerably, and most likely irrevocably" (Evaluation of the Use, 2003, p. 7).

In this extended public space, the e-democracy potential is realized through such techniques as *e-consultations, e-petitions, e-voting.*

The democratic interaction between government and civil society is an important indicator of government legitimacy. This paradigm is based on the understanding of the public administration process as "communication." Its vectors are directed not only on an internal process dedicated to regulate public bodies' activity and the regulatory impact on non-public sector subject activity, but on the dissemination of information in a horizontal direction as well. It crosses the borders of authority domain and encourages citizens and business to communicate with government and each other.

In such communication the dialectical contradiction appears when government has to combine its regulatory power with the function of a contracting party possessing rights and performing the duties of a social contract as equals to citizens and business. It is clear that this partnership equality is one of those factors, which gives grounds to evaluate government legitimacy and the correspondence of government activity to the needs of whole society.

E-CONSULTATIONS

Consultations are one of the most powerful instruments of government interaction with business and citizens. In the past, it required much more in terms of human and financial resources than is potentially available with ICT application. Today, thanks to advanced ICT, it is potentially easier to undertake the process of public consultations. However, similar resourcing problems are observed in the determination of the context/agenda of these consultations and their subsequent implementation in existing administration processes during all phases within the context of defining directions, formulating tasks, making and realizing decisions.

Consultations can be considered in a narrow sense as a process of the evaluation of public administration results with stakeholders. Under such an approach, a public agency initiates and holds consultations using vertical information flows: from authorities to stakeholders and vice versa according to a strictly defined protocol by the public agency scheme under evaluation. Such consultations often use questionnaires with all the advantages and disadvantages of this sociological instrument (as a rule, its main disadvantage is predetermination of desired "correct" answers in questions formulations). Such processes are often aimed at legalizing adopted solutions *post factum* rather than to define real needs and to offer policy options.

A more democratic type of consultation involves a public opinion survey with the possibility of interactive participation for citizens, i.e., answer options include the opportunity to not only answer from proposed options, but to offer one's own unique answer and to put alternative questions for other consultations' respondents-participants. These are interactive and a more pluralistic technique to enhance opportunities for citizens' engagement in policy making. Coleman and Gøtze (2001, p. 6) argue that "methods of public engagement can be described as deliberative when they encourage citizens to scrutinize, discuss and weigh up competing values and policy options. Such methods encourage preference formation rather than simple preference assertion."

Methods and forms of public engagement in online consultations vary from country to country. They also vary inside the machinery of public administration according to national traditions of communications between government and citizens, culture of information management, level of its transparency, knowledge and experience of government officials and potential participants of consultations, availability of technical environment and many other subjective and objective factors.

In any case, for an enhanced democratic process there must be the option to choose the appropriate consultation technique, which is based on the awareness of its advantages. Clift (2002) provides a range of useful instruments and advices for online consultations.

According to survey results held by Socitm and IdeA (2002), e-democracy initiatives realized in small communities have more chances to succeed than in large ones. For example, in the town of Jesi (Italy), the local community network created an extended democratic space for discussion and interaction between citizens and government. The high rate of Web-site hits and active participation of citizens in online deliberation testifies to the project's success (http://www.comune.jesi.an.it). As noted in this project, "The involvement of the citizen, together with consultation and promotion aimed at specific target groups—such as schools, civil associations and enter-

prises—has made an important contribution to the sharing of values and therefore to the success of the initiative" (Socitm & IdeA, 2002, p. 95).

It is worth mentioning some practical questions related to the realization of online consultations. For example, what will provide the possibility to create a more realistic view of the use of this e-democracy instrument and to take into consideration these corresponding factors during project development and implementation? The Estonia's project "TOM: Today I Decide" is of great interest as it provides interactive possibilities for the formation of online preference by the participants. By the end of 2003 "project had around 4,000 registered users and approximately 80,000 visitors per month. In spite of these rather high general indicators of participation, during last two years of project there was a substantial decrease in user activity compared to the rush of demand at the project's beginning. This requires analysis. It is useful to propose the following reasons for the activity decrease: government project administration had a definite political accent; political parties were excluded from interaction process; the passive reaction of government agencies to citizens' proposals; forum rules were not flexible enough; loss of trust among participants due to low rate of implementation of ideas forwarded to government (only 25 ideas from 450 forwarded to government had the beginning for implementation).

It is useful to note that such projects are useful not only for expressing and submitting citizens' opinions and ideas to government, but for creating added social value in the form of education and training on administrative decision-making process, encouragement of ICT usage for every day life and more active citizens' engagement in public life and the decision-making process. In support of this position, the activity of the users was not limited to virtual discussion, and because of the rejection of some of the forum's propositions by Estonian Parliament, new civil organizations for lobbying rejected legislative drafts appeared.

Among practical recommendations for increasing efficiency of public consultations, the use broad media coverage (informing about consultation agenda, schedule and real impact on policy making), liberal moderation, comprehensive planning, and culture of political deliberation have been recommended (Evaluation of the Use, 2003).

Successful usage of consultation requires evaluation of the citizens' initial needs whilst defining the consultation agenda. The establishment of useful partnership relations requires genuine citizens' participation in public consultations and unconstrained bi-directional information flows.

E-PETITIONS

The next valuable tool for citizens' direct participation in public policy making is the e-petition technique. The World Wide Web presents an almost ideal interactive possibility for exploitation of electronic petitions by providing virtual space for initiating communications, association, collection of signatures and submission to responsible public bodies.

Such a form of communication between citizens and the public sector usually has a political backbone and often produces some kind of a social echo. Petitions serve as a form of collective will, expression and submission. They have a direct impact on other social actors and imply certain regulatory function.

Protestors used the e-petition technique on the eve of Quebec Global Summit held on 20-22 April 2001. The author of the petition (Naomi Klein) mobilized the activists as soon as it became known about scheduled security measures including the construction of shielding blocks. The petition titled "People in the Cell" received support from around 4,000 people via e-mail notification and then it was published on Canadians Council site (http://www.canadians.org) and forwarded to the prime minister (MacKinnon, 2001, as cited in Borins, 2002).

Another example of the e-petition as effective e-democracy technique was demonstrated by the Parliament of Scotland together with the International Teledemocracy Center (http://www.teledemocracy.org). The operational system for starting petitions, collecting signatures and forwarding them to the Parliament online has been successfully developed and used. One of the remarkable examples is the World Fund initiative, which collected 337 signatures for marine parks' inclusion into the National Park System of Scotland.

It is obvious that the use of such democratic instruments requires corresponding legal grounds for legalizing online communication between citizens and public bodies. In the countries where electronic signature infrastructure has yet to be developed, additional measures are required for verification of signatures under petitions (for example, by direct contact with petitioners via analogue communication tools or by checking directories, etc.). The potential of the e-petition technique could be more effectively realized in partnership with private sector and local communities.

E-VOTING

In participatory (direct) democracy, the citizens' will is generally expressed by voting. The ancient Greeks dem-onstrated classical way of citizens' direct participation in everyday decision-making by voting. The remoteness of the majority of population from administrative center was one of the reasons for the appearance of representative (intermediary) democracy. Contemporary ICT provides the possibility to overcome physical barriers for citizens' direct participation in public decision-making.

E-voting is one of the techniques used for empowered (quantitatively & qualitatively) citizens' participation in policy formation and decision-making at all levels of public administration: local, national and global.

E-voting could be described as, "an election system that uses electronic ballots which allow voters to transmit their vote to election officials over the Internet" (Bouras, Katris, Triantafillou, 2003, p. 257). E-voting technique is aimed to empower direct expression of the citizens' (voters') will with the help of ICT.

In 2004 such argument was taken as a basis for pilot e-voting project of elections to European Parliament. Each country has selected the regions (with population from 50,000 to 100,000) allowing citizens to use an online voting option. The project continues with attempts undertaken at the national level in France, Italy, Spain, UK, Denmark, Belgium and Netherlands. It is notable that in the 1999 elections in Belgium around 49% of population participated in e-voting (Engström, 2002).

At the European level, we can observe several successful attempts to use e-voting for wide consultations with local communities. In 2003, the Greek Presidency realized an e-voting initiative "Vote for the EU YOU Want" which proposed in 19 languages to the Europeans to use virtual space for participation in online deliberations and e-voting on issues to be discussed. To ensure transparency and feedback, all results of the discussions and voting were published online and submitted to European Council, European Commission and European Parliament (e-Vote, 2003). The results of e-participation in this project are very encouraging. More than 500,000 users visited the Web site (http://evote.eu2003.gr) and 170,000 votes devoted to 10 topics related to EU internal and external policy were received during e-voting. It proved the people's wish to participate in policy-making using the Internet and encouraged implementation of new creative approaches for broader citizens' engagement.

In August-September 2002, the Andreas Papandreou Foundation undertook a global e-voting initiative devoted to environmental and development issues. More than 25,000 Internet users around the world from 175 countries representing 12 world regions participated in it over a one-month period (www.netpulseglobalpoll.com). It provides the evidence of the emergence of the global e-citizenship phenomenon.

FUTURE TRENDS

The examples mentioned of the use of e-democracy techniques provide the evidence that ICT has opened new possibilities for democratization of society and wider citizens' participation in policy-making at local, national and global levels.

Nevertheless, further research on the social changes evoked by the implementation of the interactive techniques of citizens' engagement in public life by ICT usage is required.

CONCLUSION

This article has examined the experience gained from the implementation of e-democracy techniques aimed to increase citizens' participation in decision making. It's clear that we are witnessing the beginning of new evolutionary step of democracy with empowered possibilities for citizens to participate directly in public administration extended by e-democracy techniques in public space.

I believe that the new advanced e-participation methods mentioned show solid promise to be implemented as widely as possible in everyday public administration and should be constituted as integral parts of today democratic governance. Assessment of the proposed and already implemented e-democracy projects has to be based on the evaluation of the additional social values created in the form of more deliberative, participatory and thus more democratic decision-making.

The main question remains: Can we create a more democratic form of public administration by using ICT? Whilst history will find the answer to this question, in such processes the key role to be played is that by all social actors joined with common aspiration for e-democracy.

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E

KEY TERMS

Added Social Value: A positive social effect (main or subsidiary impact on social relations) resulted from goal-seeking activity of social actors.

E-Consultation: An e-democracy technique used for research of stakeholders' views, evaluation of proposed rules regulatory impact by ICT usage.

E-Democracy: (1) Interaction between public, private and third sectors by ICT usage in democratic processess (2) The way in which citizens interacts with government by ICT usage.

E-Democracy Techniques: The ways (methods) of citizen engagement in process of decision-making based on ICT usage. The main techniques are: e-consultation, e-petition, and e-voting.

E-Governance: The process of administration (elaboration and implementation of policy decisions and administration services delivery) based on full-scale ICT usage at all levels of decision-making and all branches of public administration.

E-Petition: An e-democracy technique used for citizens' appeal to public bodies by ICT usage (e-mail, online forums, public bodies online interface).

E-Voting: An e-democracy technique used for direct expression of voters will in collective decision-making by ICT usage.

Forging Partnerships to Provide Computer Literacy in Swaziland

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INTRODUCTION

The challenges facing the world, especially developing countries like Swaziland, are many and varied. The United Nations Development Programme (UNDP) estimates that over two billion people, out of a global population of six billion, do not have access to education. The majority of these people are found in developing countries. As many as 113 million children do not attend school. More than one billion people still live on less than US$1 a day and lack access to safe drinking water. More than two billion people in the world in developing countries in particular, lack sanitation. Every year, nearly 11 million young children die before their fifth birthday, mainly from preventable illnesses. The risk of dying in childbirth in developing countries is one in 48 (UNDP, 2003). In most developing countries, especially in remote areas, the situation is exacerbated by lack of electricity.

The key solution to most of these challenges is education. More importantly, it is the acquisition of critical knowledge, skills and attitudes crucial for economic development and growth leading towards the improvement of the quality of life. Indeed, knowledge has been recognized as the heart of economic growth and sustainable development (World Bank, 2002) and it is at the core of a country's comparative advantage (Porter, 1990). Countries endowed with intellectual resources in critical areas have tended to achieve the highest rates of economic growth and have had the fastest growth in science and technology (Iredale, 2003).

A study by the Organization for Economic Cooperation and Development (OECD) on the determinants of growth concluded that underlying long-term growth rates in the OECD economies depended on maintaining and expanding the knowledge base (OECD, 1998). The World Bank Report 1998/1999 noted that most technologically advanced economies were knowledge-based and that comparative advantage among nations was less from abundant natural resources or cheap labour and more from technical innovations and comparative use of knowledge or both (World Bank, 1999).

Invariably, investing in human capital in developing countries would be the most sensible way of creating wealth for economic growth and for dealing with many social and environmental challenges (Iredale, 2003). Investing in human capital will enable developing countries to produce, select, adapt, commercialise, and use the knowledge economy to sustain their economic development and growth and improve living standards of the people (World Bank, 2002).

One of the key drivers of the knowledge economy, economic development and growth is technological development in Information Communication and Technology (ICT) such as electronics, telecommunications, satellite technology, computers, the Internet, etc. This is because ICT has significantly changed the speed of production, distribution, and the use of information and knowledge. ICT has the potential to close the "digital divide" between the North and South and enable developing countries to effectively participate in the global economy. As Peters (2004) points out, ICT is a key weapon in the war against poverty because when used effectively it offers huge potential to empower people. It overcomes development obstacles, addresses their social challenges, and strengthens communities, democratic institutions, a free press, and local economies.

Indeed, investments in ICT have had positive impacts on developing countries' economic development and growth (World Bank, 2002). For example, an International Labour Organization (ILO) study of some developing countries which had invested in new information and communication technologies found that these technologies had positive impact on their economic development and growth and enabled them to compete in the global market (ILO, 2001).

ICT facilitates government operations and services in health care and information, education and training, employment, job creation, business enterprises, agriculture, and transport. ICT may facilitate protection of the environment, management of natural resources, disaster prevention, and culture (Dark & Eskow, 2000; International Communication Union, 2003). ICT is crucial in sustaining production and consumption patterns and reducing traditional barriers in society by providing opportunities for people to access local and global markets.

THE CHALLENGE

Unfortunately, ICT is not easily accessible to many developing countries due to several factors such as lack of financial resources to pay for Internet connectivity, purchase computer hardware and software, modems, and maintain them. Also, the infrastructure of copper wire telephone lines is unreliable, the bandwidth for Internet Service Providers (ISPs) is limited, and there is inadequate technical capacity to manage and maintain the infrastructure and equipment. As a result, the number of people connected into the Internet in developing countries is far less than the number of people connected into the Internet in developed countries.

In 2002, for example, of the 332 million people connected to the Internet worldwide, only 1% was found in Africa and less than 5% of the computers in developing countries were connected into the Internet (Naidoo, 2001). Similarly, in 2000 Africa had the lowest (0.25%) number of Internet hosts compared to the other regions of the world such as Oceania (1.9%), Asia (6%), and the Americas. In the same year, the USA alone accounted for 73.9% of the total Internet hosts in the world (Reddy & Manjulika, 2002). In 2001, Nigeria, with a population of over 108 million people, had a negligible Internet connectivity of fewer than 500,000 lines (Naidoo, 2001). In Africa, each computer with an Internet or e-mail connection supports about three to five users. Thus, the estimated number of Internet users in Africa, apart from North Africa and South Africa is between 1.5 to 2.5 million. This is about 1 user for every 250-400 people, compared to a world average of about one user for every 15 people, and 1 in every 2 in North America (The African Internet: Status Report, 2002).

In Swaziland, there is an acute shortage of computers in schools. Indeed, lack of Internet connectivity has resulted in many children graduating from high school without having seen or touched a computer (Kunene, 2004). In 2002, for example, 98% of the school children in Swaziland graduated from high schools without having seen or touched a computer (Kunene, 2004; Hesselmark & Sibiya, 2002). The average number of computers per school was less than 1%. Where a computer was available in a school, it was generally used for administrative purposes rather than for educational purposes. What worsened the situation was that teachers had not been trained in teacher training institutions on how to use computers for teaching purposes, nor was ICT included in teacher education curricula. This then resulted to a serious shortage of professionals with computer skills in the private and public sectors, non-governmental organizations, and schools. This article describes how a group of partners collaborated to introduce computer literacy in primary and secondary schools of Swaziland.

THE COMPUTER EDUCATION TRUST (CET)

In light of the importance of the knowledge economy and ICT in economic development and growth, and the fact that so many children graduated from school education without having seen or touched a computer, a Computer Education Trust (CET) was established in Swaziland in 1999. The Computer Education Trust was established by Nathan Kirsh, a business magnate, in collaboration with the Ministry of Education and other partners [the Computer Aid International (CAI) and Department for International Development (DFID) in the United Kingdom, the Mobile Telephone Network (MTN) in Swaziland, and the Swaziland Post and Telecommunication Corporation (SPTC)] (Hesselmark & Sibiya, 2002). The Computer Education Trust is a non-profit, non-governmental organization legally registered in Swaziland. It is managed by a board of directors, whilst the executive director manages the day-to-day activities of the Trust.

Objectives of the Computer Education Trust

The main goal of the Computer Education Trust is to extend computer literacy and vocational ICT to every child in secondary and high schools in Swaziland by providing refurbished computers. The objectives of the Computer Education Trust are to:

- access refurbished computers from Computer Aid International (CAI);
- facilitate custom clearance, distribution logistics and installation of computers into each school;
- provide full technical back-up and maintenance services in schools;
- collaborate with the National Curriculum Centre (NCC) in producing teaching materials;
- develop and produce a manual for training teachers;
- provide technical support and on-going advisory services to schools through part-time staff (i.e., on-the-job-training);
- provide minimal teacher training in computer literacy; and
- coordinate and lobby interest groups, opinion leaders, and decision makers to support the initiative for computer education in schools.

The programme effectively started in 2000 with 24 pilot schools, each receiving about 24 computers. By May 2002, the programme was operational in 36 secondary schools. By April 2004, the Computer Education Trust had donated 1,700 computers to 187 secondary schools. This meant that in 2004, 45% of the students had access to computers compared to 2% in 1999.

Partnerships

In effect, the Computer Education Trust receives donated refurbished computers from Computer Aid International (CAI) in the United Kingdom. Computer Aid International is a charity organization based in England and Wales. It refurbishes and it re-cycles donated computers for re-use in schools and community organizations in developing countries. CAI has a team of about 30 un-paid volunteers who test and refurbish the computers before they are packed for shipment to developing countries. By 2000, in just over three years of operation, more than 3,500 computers were shipped to 31 developing countries. Nathan Kirsh and the British High Commissioner have provided the financing of shipment of the refurbished computers from the United Kingdom to Swaziland. As of March of 2001, CAI had shipped 1,221 computers to Swaziland (Hesselmark & Sibiya, 2002).

In Swaziland, a small team of technicians inspects the refurbished computers on arrival and prepares them for installation in schools. Schools allocate or build a computer laboratory to house the refurbished computers. In addition, schools ensure that the computer laboratory has adequate space to house at least 20 computers, security, power and ventilation.

The Computer Education Trust has formed a large number of alliances and partnerships with stakeholders to secure support for the introduction of computers in schools as well as attract financial resources. For example, the United Nations Development Programme (UNDP), the United Nations Education Science and Cultural Organization (UNESCO), and the Swaziland Mobile Telephone Network (MTN) all supported the Computer Education Trust programme by funding the capacity building. The Swaziland Post and Telecommunication Corporation (SPTC) reduced the cost of Internet connectivity to schools by 50% to make it affordable. The Customs and Excise Department exempted the imported refurbished computers from taxation. The Rotary Club assisted CET in the procurement of additional computers in some schools.

Training Computer Educators

When the Computer Education Trust started, most of the teachers in schools were not trained in computer educa-

tion. Hence, there was need to build the capacity for teaching computer education in schools. The Computer Education Trust, in collaboration with institutions of higher learning, provided guidance on, and funding for, preparing and producing teaching materials for training computer teachers and for teaching school children. The schools nominated teachers to teach the basic computer courses to school children. The University, in collaboration with CET, offered an ICT in-service sandwich. The course focused on teachers who have never had the opportunity to acquire basic computer literacy skills. UNESCO funded the first cohort of in-service teachers. Recently, the University of Swaziland offers a basic computer course to all first-year students so that all graduates would have basic computer literacy. Thus, all teachers graduating from the University have virtually acquired basic computer literacy skills.

KEY OUTCOMES

The key outcomes of the Computer Education Trust programme are that:

- schools have quality re-cycled computers to enable children and teachers to acquire computer literacy,
- children and teachers have access to electronic information,
- the quality of basic and vocational education is greatly enhanced,
- the acute shortage of computer skills in industry and commerce is gradually reduced,
- there is an opportunity for Swaziland to compete in the global information economy.

CHALLENGES FACING CET

Like all initiatives, the Computer Education Trust and its partners face major challenges. These include:

- lack of a curriculum on computer education that is examinable,
- introduction of ICT education in schools,
- lack of properly trained teachers to teach computer education as a full-fledged subject in the school curriculum, and
- the slow pace of building computer laboratories by schools since this depends upon school fees and contributions from parents (Hesselmark & Sibiya, 2002).

Currently, government is working on a national policy that would clearly articulate the provision of the infrastructure for Internet connectivity throughout the country. Indeed, schools and institutions of higher learning would be expected to review their curricula with a view to incorporate ICT, especially computer literacy and the use of the Internet. It is hoped that graduates of these institutions would be computer literate. This will, in turn, reduce the shortage of skilled people in ICTs, address the problem of digital divide, and enable Swaziland compete in the global economy. The Computer Education Trust and its partners is just a start.

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KEY TERMS

Access: Refers to the ability to get into, and use, an online system. Access to the Internet through commercial online services requires an account, an access telephone number, a password, and special software designed for that service.

Bandwidth: A measure of how much information or data path times frequency. For example, the ISA bus has a data path of 16 bits (it can send 16 bits at a time) and typically operates at 8.33MHz, so it has a bandwidth of 133.28 megabits per second. It is the speed of a connection between computers. The range of frequencies (size of the "pipe") available for carrying information, and the total amount of data or information that can be transmitted via a given communications channel (e.g., between a hard drive and the host PC) in a given unit of time.

Computer Hardware: Refers to computer equipment such as a CPU, disk drives, modems, printer, etc.

Computer Literacy: The acquisition of basic knowledge and ability to operate or use a computer.

Digital Divide: The gap that exists between those who have and those who do not have access to technology (telephones, computers, Internet access) and related services. This term may also be used to describe the distance between those individuals or countries which have network capabilities and those which do not, those who can afford the technology and those who cannot.

Electronic Mail (E-Mail): The use of a computer for personal or business communications. An e-mail is an electronic document similar to a piece of mail that is sent from one person to another using an address, and contains information. Users leave short, written message in each other's computer "mail boxes." E-mail commonly contains information such as sender name and computer address, list of recipient names and computer addresses, message subject, date and time composed, and message content. Sometimes an e-mail message can have attached computer files such as pictures, programs, and data files.

Host: A computer which is connected directly into a network such as the Internet. Whenever one dials into the Internet, one makes a connection through a host computer.

Information and Communication Technology (ICT): The amalgam of computing, telecommunications and data networking technologies used to handle information and communication. It is the convergence of Information Technology, Telecommunications and Data Networking Technologies into a single technology. It encompasses an array of hardware and software such as computers, digital cameras, CD-ROMS, radio, television, video and digital cameras, digital media, the Internet, e-mail, word processing, databases, the Internet, e-business and e-commerce.

Internet: This is a world-wide interconnection between computer networks using a set of routers or Transmission Control Protocol/Internet Protocols (TCP/IP) on many different platforms. The routers allow computers to function as a single, large virtual network, and users to communicate with each other no matter what their location. It sends electronic mail, finds information, and allows users to engage in person-to-person exchanges.

Internet Service Provider: A company such as a Netcom, UUNet, and SprintNet that sells to users Internet connectivity, either via a twenty-four hour dedicated line, or a dial-up connection. This could either be on a dedicated connection (for example, a telephone connection that stays open 24 hours a day) or a dial-up connection. Usually users run software such as PPP or SLIP to allow Internet connectivity across the line.

Modem: A data communications device standing for "modulator-demodulator." It receives digital signals or information over a telephone line and translates them into analogue ones and/or vice versa. It enables a computer to communicate with other computers over telephone lines.

Software: A computer programme that provides instructions that tell a computer what to do.

Telecommunications: The transmission, emission or reception of signs, signals, writings, images, sounds or information of any nature by cable, radio, visual, optical or other electromagnetic systems. It refers to long-distance communication carried out with the aid of electronic equipment such as the Radio, Telegraph, Telephone, and Television. The information that is transmitted can be in the form of voice, symbols, pictures, or data, or a combination of these. The physical equipment for a telecommunications system includes a transmitter, one or more receivers, and a channel or means of communication such as the air, water, wire, cable, communications satellite, or some combination of these.

User: A person who works with a computer without bothering about the "hows" and "whys" of its functionality, like a person who reports a virus instead of fixing them.

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Formation of a Knowledge–Based Society through Utilization of Information Networking

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THE CONTEXT OF THE INFORMATION SOCIETY FOR BANGLADESH

"Information society," "knowledge network" and "digital divide" are terms becoming increasingly common in many parts of the world over recent years. The key element in these concepts is that of "information," and its fluidity in the modern world. Information can be viewed as the foundation stone of this new phenomenon and is the collation of raw and un-processed data into meaningful dialogue. Many societies and communities in developed and developing situation have settled on the term "information," to describe the new economy and be the basis of development in the new millennium.

The Information Society is created by information, in a similar way that the industrial society area was created by manufacturing. This new Information Society is therefore a society being produced by a reliance on information as the most significant factor in the means of production. Hence, it relies on the information economy to produce products, services, employment, wealth and life style on which the community depends. It is believed that ultimately the whole community of a country can benefit from the optimum utilization of information in each and every corner of society.

Knowledge, on the other hand, is dynamic and capable of creating dynamism in a similar way to capital and labor. Money, work and information are catalysts, while knowledge, capital and labor are concepts containing stored endurance and cultural interpretation. Given the right incubation, they are capable of creating fruitful outcomes. Building a knowledge network molded by information can accelerate the pace of development.

In Bangladesh, efforts have been allocated to accommodate propositions on developing a nation wide information network using the existing information backbones. As a result, a centrally driven content repository may eventually be established.

INTRODUCTION

The Information Age is challenging the role of the expert in society and, therefore, the relationship between expert and amateur (Handy, 1997). The WWW (World Wide Web) has created new opportunities for self-learning in a wide range of expertise previously dominated by specialists. Specialists and professionals in all aspects of human life are benefiting through this expert support. Thus, knowledge is evolving as the result of information acquisition melded with experience where many amateurs can develop to act as effectively as experts.

Knowledge management incorporates huge data storage facilities, contents in distributed databases and an effective retrieval system. It means planning for research, linking ideas to generate information and conceptualizing the notion of a knowledge society. The knowledge society can bring more ability and options to the stakeholders through methodologies like self-paced learning, forming common communities through mass networking and by maintaining maximum flexibility in learning sequences.

Mass networking is one of the prerequisites to form a homogenous, multidimensional, dynamically developed and research-potent knowledge-based society. Academics, institutes, research organizations, civil society, government and non-governmental agencies, and other partners/stakeholders of the community should be able to interact with each other through a common horizontal platform.

In response to the challenges of globalization and the information society, each country needs to set out its own strategic objective for the coming decade, and to become the most competitive and dynamic knowledge-based economy in the global market, capable of sustainable economic growth with better jobs and greater social cohesion.

Bangladesh is a country of 133.4 million people. With a minimal GDP of 357USD, 33% of the population lives under the national poverty line. More than 80% of the population resides in difficult accessible rural regions, where information infrastructure is very thin and formation of a common information backbone still remains an open challenge to the society.

In order to address the issues faced by much of Bangladesh, detailed programmes and action plans on the future of education and training systems need to be prepared. The policies need to be implemented using "open coordination concept" among all the partner organizations.

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STRATEGIES

In addressing the obvious needs of Bangladesh in the Information Age, strategic plans need to be initiated at the national level and incorporate flexibility in each stage of the development and action, to deliver optimum resource utilization and to maximize benefits. The new strategy requires an indigenous method, an open coordination concept, a realistic measure:

- identifying and defining common objectives; and
- stimulating the quality and relevance of locally based capacity enhancement programmes.

In discussing information and knowledge, it is useful to start by observing that both are human creations (or social constructs). They are designed to explain and meet some of the challenges that individuals or groups face at a particular time and place. No one fully understands the meaning of knowledge and information without recognizing that they can both be "double-edged swords." They can be used to empower individuals and groups. They can also be used to continue and reinforce relations of power and control. When a ruling group uses information and knowledge to control (dominate) people, those people are led to despair, powerlessness, and unsustainable life styles (Mchombu, 2002).

Several aspects of the emerging framework for the Information Age in Bangladesh that are essential for bringing communities to a common platform by raising their capacity through the utilization of ICT techniques are now discussed.

Policy Initiation

To increase socio-economic development, government must undertake broad-based action plans. The inclusion of the following section in the ICT Policy of Bangladesh, is a positive step in this respect:

Socio-economic development can be accelerated if more people can have access to information. Teledensity is important in this respect and it will be increased to broaden the coverage, which will improve the socio-economic condition of the people through ICT-related activities in line with experience of developed countries. (ICT Policy, 2002)

Secondly, ICT Policy accommodates steps towards capacity development of the general population:

Widespread introduction of ICT education in public and private educational institutions is a prerequisite for producing skilled ICT manpower. (ICT Policy, 2002)

Finally, the ICT Policy needs to recognize that the information infrastructure needs to be upgraded to allow the formulation of a national data bank to assist the development of millennium initiatives:

A central depository for collection and dissemination of ICT information and research findings will be developed. This will be done under a network, connecting all university libraries and research organizations to this central depository, which in turn will be connected to the Internet. (ICT Policy, 2002)

Education

Education is by necessity a primary concern in all countries. Although the structures of education systems differ considerably, both within and amongst different countries, a mass literacy campaign should be given the first preference in a country's education system. Bangladesh, with 38% of the population being illiterate, needs to upgrade its education programmes to raise literacy. The government is keenly interested to make the country 100% literate by 2006.

Predictions about the economic and social impact of Information and Communication Technologies (ICT) abound in the literature and the economic and social behavior of society. The technological trends are extrapolated to illustrate potential benefits and by adopting a visionary perspective, resulting in predictions of "revolutionary changes" in the global knowledge society. Advances in ICT have been particularly striking in the areas of digital computing and communication networks (Carlos et al., 2003). Superimposed on these factors, education systems no longer remain removed from the basic societal aggregations. Scholars, researchers, and educators are striving hard in Bangladesh to produce quality education systems using the benefits of ICT. Educational networks have become a prime urgency in Bangladesh. In this context the interaction between technological development and new approaches to education become increasingly important in previously unserviced situations.

The Semantic Web is expected by many to open new opportunities to manage information while allowing for new Web functionalities with significant storage potential. Artificial intelligence and expert systems are expected by many to gain a novel power and utility as standards for distributed computing and grid systems spread around the world. New technology-based infrastructure developments open new possibilities for regions with low-bandwidth connectivity to leapfrog stages of development by entering the "broadband" phase via wireless solutions. The Wi-Fi phenomenon is a good example of the "law of unintended consequences" in action as a

technology originally designed to support wireless local area networks is beginning to pave the way to establish of low-cost broadband telecommunication systems at the outset (Rahman, 2003a).

Lifelong Learning

Another core element of the Bangladesh ICT strategy is the concept of lifelong learning, which is central not only to competitiveness and employability but also to social inclusion, active citizenship and personal development (EU, 2002).

Lifelong learning has become the guideline principle for the development of education and training policy. Following this path the learning of new technologies has become a priority in an ever-changing society.

Although the area of corporate distance education is new, a study by the International Data Corporation (IDC) reported an annual growth rate of 63.5% for distance learning from 1992 to 1997 (EXEN Partners, 1998).

Learning is dependent on the use and application of information and in how information is contextualized to become knowledge. That such a process is socially mediated and is dependent on social interaction is evident (Freund, 2003). Developing a learning organization is a huge challenge. Developing a learning partnership is an even greater challenge. It hinges very much on a willingness to learn from each other (Chetley, 1998).

Networking

Increased networking among education institutes, research organizations, and eventually government and non-governmental agencies to establish interactive information exchange platform, by sharing knowledge and expertise in formulating effective governance, knowledge networking and mass information dissemination at the grassroot level would enhance the development processes.

Proficient utilization of network resources in disseminating knowledge-based information in online and off-line environments formulates a concrete platform of a collaborative research base and collaborative learning sequences (Rahman, 2003b).

Transborder data flow (TDF), or the transfer of information across borders, is becoming commonplace due to developments in electronic communications. Amongst developed countries in the Western world, TDF has been happening for years with the facsimile machine being the first major tool for easy information transfer. But developing and transitional countries are lacking the basic infrastructure to allow them to carry out TDF, leading to gaps in their knowledge base and creating information impoverished societies (Allen, 1999).

Today, developed countries show that access to the Internet can, and has, dramatically transformed every aspect of the society and economic activity that rely on access to information. For developing countries, large-scale access to the Internet still remains to be fully addressed, leading to an ever-increasing digital divide with developed countries. Recent studies by the World Bank show that Internet access, based on telecommunication infrastructure (fixed networks, mobile or satellites), constitutes the fastest growing technology within the ICT sector. There is, therefore, a need to accelerate the on-going Internet penetration efforts (especially in developing countries), by deploying technology that is both scalable and affordable to end-users. High prices charged by few service providers, and poor (or at times a lack of) terrestrial connectivity to majority of the population in rural areas may inhibit large-scale Internet access in developing countries (Koyabe, 1999).

Virtual Networking

Networking can be divided into two forms: Physical networking and Virtual networking. Physical networking is infrastructure independent, while Virtual networking is being superimposed over the available infrastructure. Virtual networking should adopt low cost or open-source software utilities to form a common platform of communication among geographically distributed locations. Based on this concept, educators are availing the facilities to form groups and dissemination hubs through e-mail, e-groups, BBS (Bulletin Board Service), virtual seminars and moderated discussions.

Available technologies can be integrated to form low cost information provider. Utilizing interactive distance education techniques, educators and learners can be bought together in a common collaborative platform to make the system cheaper and easily available to remote users.

Virtual learning involves the use of some form of electronic media to enhance the learning processes. Sometimes confused with distance learning (a broader delivery medium that would include text-based learning and courses conducted via written correspondence), courses are delivered via "e-learning" when technology is used to bridge both an instructional and a geographical gap. Accommodating a range of activities, from effective use of digital resources and learning technologies in the classroom, to a personal learning experience enabled through individual access at home or elsewhere, virtual learning is essentially the facilitation of teaching and learning via the use of some electronic medium.

Knowledge Management

As the term "knowledge management" slips easily into the vocabulary of libraries, we are in danger of understanding the power and extent of the paradigm we invoke.

It is not just that industries based on knowledge are developing. It is not just that information, like machinery, becomes essential to any business or enterprise. If we consider what infrastructure—networks, organization, bodies of research, commentary, jobs, regulation, legislation—is in place to support the constructs of labor and capital in our society, we begin to glimpse what might be in store for the "knowledge" concept in an information society (Dellit, 1998).

Knowledge management is not a precise enclosure of means that professionals can easily learn and just apply in specific situations. Knowledge management is a complex web of ideology, values, dependencies, power relationships, learning, maneuvering, social and economic analysis, the essence of knowledge, behavior and techniques.

The European Union (EU) is a forum for the exchange of ideas and good practice. It does not have a common education policy, however. On the contrary, its role is to create a system of genuine cooperation between the Member States by preserving the rights of each Member State in terms of the content and organization of its education and training systems (EU, 2002).

Information Networking

Information networking is not a new concept in this globalized society. Utilizing the information backbone and Internet, educators, society leaders, researchers, policy initiators and other development partners are acting around the globe for promoting sustainable development and alleviating poverty. Awareness raising, promotion of literacy, agricultural extension, disaster management, and many other important aspects of the current society are taking benefits of the communication networking.

There exist several networks in Bangladesh, in discrete and isolated forms. Bangladesh Open University with 12 Regional Resource Centres spread over the country through a dial-up network (http://www.sdnpbd.org/sdnp/maps/pic6.htm) is used mainly for administrative purposes. Similarly, another secluded network, the Bangladesh Education and Research Network (BERNET), is maintained by the University Grants Commission (UGC) (http://www.ugc.org).

BERNET included 128Kbps radio link connectivity with a private ISP and this link has been distributed to the Bangladesh University of Engineering and Technology (BUET) (64Kbps) and the Dhaka University (64Kbps). Some of the other state-run universities are connected to UGC server by dial-in connection. Among them, the Shahjalal University of Engineering and Technology in Sylhet has its own VSAT linked network connected to the Internet.

Recently, a few other universities are establishing their own network using VSAT connectivity. Government organizations, like, the Ministry of Health, Ministry of Education and Ministry of Agriculture are extending their networks down to their district town outlets, using mainly dial-up. The state-owned telco, the Bangladesh Telegraph and Telephone Board (BTTB), is also trying to connect each district town through several types of connectivity (Fiber, Digital Data Network and Dial-up).

Sustainable Development Networking Programme (SDNP) of Bangladesh (http://www.sdnpbd.org/sdnp/maps/pic4.htm), a UNDP-funded project, under the Ministry of Environment and Forest (MoEF) and implemented by the premier socio-economic research institute, Bangladesh Institute of Development Studies (BIDS), is maintaining a network comprised of radio links, ADSL and dial-up. One of its regional setups has been running successfully for about a year in the Bangladesh Agricultural University (BAU) in Mymensingh at a distance of 120Km away from the Dhaka city (http://www.sdnpbd.org/sdnp/maps/pic3.htm, http://www.sdnpbd.org/sdnp/tech_support/4.gif). Recently, SDNP has extended its network along the coastal belt of the country using VSAT connectivity (http://www.sdnpbd.org/sdnp/maps/radio_station.htm, http://www.sdnpbd.org/sdnp/maps/mcpc.htm). This project aims to capitalize on this information network to create an appropriate IT-based mechanism for facilitating the exchange of information/knowledge among policy makers, the civil society, academia and development partners, locally, nationally and internationally, to support initiatives and processes of sustainable development in Bangladesh.

Among others, schoolnet (http://www.sdnpbd.org/sdnp/maps/school_pro.htm), online blood bank (http://www.sdnbd.org/sandhani), virtual library information system (http://www.sdnbd.org/cgi-bin/books.cgi), sustainable development information data bank (http://203.76.110.35/sdi/home.jsp) are other initiatives towards formation of a knowledge-based society in the country for sustainable development. However, the project should accommodate the deprived southwestern part of the country, where an infrastructure backbone is almost missing. SDNP has been proposing (http://www.sdnpbd.org/sdnp/maps/pic2.htm) for alternate funding to accomplish this task.

Coordinating the majority of the above-mentioned networks, a nation-wide information backbone has been established to act as an advanced research network (Bangladesh Advanced Education, Research and Information Network, BAERIN) (http://www.baerin.net) in the country. With little initiative and effort, this network may emerge as the national repository of information and provide enormous opportunities in information networking and knowledge management.

CONCLUSION

With open discussions and public input, also including education researchers, the integration of a scientifically based research network for education and research may be developed on the back of existing individual efforts. This will necessitate regular interaction and a highly developed spirit of cooperation through a core work group under a National Steering Committee. It is encouraging to note that already the government has initiated some changes in the ICT policy as a result of input and scrutiny from the education and research community.

To become critical users of information and knowledge, community members will want to analyze critically both the knowledge that comes from outside the community, and their own inherited knowledge. The community will want to study, for example, how cultural and elitist definitions of gender, race, tribe, class, poverty, are developed as both historical and social constructs. In most cases, these definitions should be questioned and critiqued so that value is added to achieve more transformative knowledge and information for the community (Mchombu, 2002).

The nation-wide distributed network should give emphasis to the accumulation of local content directly beneficial to the community and localized global content fitted to suit the capacity of the participant. Integrating modular learning patterns in different platforms of the society, overall capacity can be raised at a functional level.

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KEY TERMS

Digital Divide: "Digital divide" is a term used to describe the gap between the technology "haves" and "have-nots." It is a gap in opportunities experienced by those with limited accessibility to technology.

Information Society: A society in which economic and cultural life is integrated by complex communication networks, and critically dependent on information and communications technologies.

Knowledge Management: "Knowledge management" is a concept in which an enterprise gathers, organizes, shares, and analyzes its knowledge in terms of resources,

documents, and people skills. It involves capturing, warehousing, transforming, and disseminating data/information within an organization to leverage knowledge for competitiveness enhancement.

Knowledge Network: Knowledge is information with guidance for action based upon insight and experience. A network is the connection of two or more entities so that they can share resources. A knowledge network is an interconnected resource entity to improve the results of perception and learning, and reasoning.

Lifelong Learning: A process of acquiring knowledge or skills throughout one's lifetime via education, training, work and general experiences. It is a concept of continuous personal development through personal learning with an emphasis on independent study determined by contextual personal needs.

Virtual Network: A form of network that refers to the appearance of a single, seamless network system. This type of network provides virtual circuits established through a real network.

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Free/Libre Open Source Software for Bridging the Digital Divide

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INTRODUCTION: THE FORGOTTEN USERS IN SOFTWARE DESIGN

As some scholars claim, the digital divide, referring to the perceived gap between those who have access to the latest information technologies and those who do not, entails that not having access to this information is an economic and social handicap (Compaine, 2001). In software design, structured inequalities operate along the main axes of gender, race/ethnicity and class. Each of these in turn generates its own structure of unequal practices giving rise to institutionalised sexism, racism or class divisions/conflict. "Gender, race and class also crosscut each other in various complex ways, sometimes reinforcing and at other times weakening the impact of existing inequalities" (Cohen & Kennedy, 2000, p. 100). For instance, Webster's research (1996) employing feminist approaches to study computer system designs addresses the issue of a male-dominated system design field, which continuously excludes female users' needs, requirements, interests and values in the innovation process. She criticises that, "Human factors may be bolted onto existing methods of systems design, local and contingent knowledge of work and information handling processes held by users in an amorphous sense may now even be incorporated into the systems design process, but this does not create an awareness of the way in which skills and knowledge are defined in gender-divided terms" (p. 150).

In a similar course, I argue that users' experiences in developing or undeveloped countries are often ignored in mundane software designs led by developed countries. Although localisation of information infrastructure is an eminent issue emerging in current system development, profit-oriented products and services, such as Microsoft's local language program (LLP), do not really comply with local needs. Rather, this type of multi-languages software packages, a software suite fabricated universally for countries around the world, signify the phenomenon, which I term the "MacDonaldisation of Windows-Intel platforms," which in fact alienates users and the local contexts.

FLOSS IN ACTION

In recent years, free/libre open source software (FLOSS) has emerged as an important phenomenon in the information communication technology (ICT) sector as well as in the wider public domain. An increasing number of governments have endeavoured to either convert the public administration infrastructure from Windows to Linux or to adopt FLOSS for similar tasks (e.g., Munich in Germany or Zaragoza in Spain) (c.f., "Linux in Spain" on LWN.net; C|Net News.com August 29, 2001). FLOSS transparentises the often black-boxed software code and allows users to copy, distribute and modify a programme received freely. In making source code available, software technologies can be challenged, adapted, and ameliorated to satisfy diverse user needs. Apart from solving the prolonged usability[1] problem in software engineering, implementing FLOSS also helps ground both social and technical knowledge in locales and bridge the digital divide. In other words, implementing FLOSS facilitates technical knowledge (e.g., programming skills and ICT expertise) and social experiences to be transported and transferred through the acclaimed practices of social networking and mutual help noted prominently in many recent community studies (e.g., Wellman, 1999; Rheingold, 2000; Hampton & Wellman, 2003; Jordan et al., 2003; Lin, 2004a).

There have been a number of tactical considerations of implementing FLOSS in countries or organisations devoid of intellectual or financial resources: for economic reasons to save software costs; for educational reasons to improve human resource; for political reasons to stop monopoly proprietary software from expanding their market share as well as to gain digital autonomy, just to name a few. Hence, it is a strategic interplay for local governmental or non-governmental organisations (NGOs), and FLOSS activists to coalesce to tackle these inequalities. Because knowledge transfer is as crucial as infrastructure implementation, hands-on training made available to the local users is essential in the execution. Projects such as the E-Riders[2] and Low Income Networking and Communications[3], or events such as the Summer Source Camp[4] and Africa Source[5], all illustrate the transfer of knowledge and technology across cultural boarders. These examples

also show how the implementation of FLOSS shapes the lives and identities of local users as well as software developers around the globe (Lin, 2004b). Additionally, there is conspicuous implementation of Linux-based infrastructure in the local educational, NGO and governmental organisations in developing countries or regions (e.g., Washington Post, November 3, 2002). The advents of embedded technologies such as the "Simputer," a Linux handheld applied in India, are believed to enable affordable, sustainable village development in places without phones and power, giving more and more people a voice in the conversation about their future (Cherlin, 2002). Wireless technologies are amongst others to bring the Internet to developing countries or regions to facilitate networking at both local and global levels. Krag, a Danish expert of wireless technologies who I met at the 2003 summer source camp in Croatia, describes wireless technologies as low-cost and decentralised. Here is a quote from his talk at the O'reilly 2004 emerging technology conference[6] about the advantage of wireless technologies:

Billions of people in the world have never been online. The Internet as a technology is an elitist tool, reserved for the few and unreachable by the many. This is a problem not likely to be solved by the commercial interests of existing telecommunications companies and existing ideas about expensive, centralized infrastructure. But low-cost, decentralized wireless technologies could have an important role to play, in this respect. Their low price point and decentralized nature, and the openness of the standards, mean that these technologies are incredibly adaptable to new situations and new uses. (Krag, 2004)

Krag and his colleagues have been working in undeveloped/developing countries around the world, building up and promoting wireless technologies (mainly 802.11b standard, also known as WiFi) for the locals. They bring the Internet and intranet connectivity to those parts of the world not included in the plans of the commercial telecommunications companies. They teach and give hands-on training to the locals about how to use ICT, and at the same time build wireless networks in the countries they visit. In so doing, they hope to "not only raise awareness and heighten skill sets, but also gain the experience necessary to build a central repository of documentation and tools, targeted specifically at the developing world" (ibid.). Krag's words subtly show that working with the locals de facto benefits the legitimate knowledge system of wireless technologies by means of bringing in more empirical cases that illustrate how infrastructure can be turned into applications, and how experiments can be turned into existing proofs. That said, working in undeveloped/de-

veloping areas in fact is not a one-way giving episode, rather, it is a reciprocal process that involves mutual help and mutual learning. Sometimes, extra functions are endorsed to the original products or facilities to meet local users' needs or habits ad hoc. The local contingencies entail that products and facilities can be renovated with the new functions and features after being deployed in local environments. This close link with global and legitimate knowledge sets also suggests that local expertise is worth being documented or transcribed in order to understand the construction of a knowledge-based society from both macro and micro levels.

DEMOCRATISING SOFTWARE INNOVATION PROCESS: WHOSE DEMOCRACY?

Given the advantages of FLOSS, it is believed that FLOSS is seen as an effective tool and approach to tackle the digital divide. Although FLOSS provides more flexibility and economic good for local users, solutions are mostly identified and crafted from the point of view of the developed countries. The collaborative episodes between NGO and FLOSS sectors illustrated above show an ambition to mobilise awareness and participation, and build capacity. However, when taking the local requirements into account, the social problem of the digital divide is perceived merely in the eyes of some NGO and FLOSS workers, rather than derived from the locals. Whereas a FLOSS-based solution seems to bridge the digital divide more efficiently than proprietary software, it sometimes still ignores that the political-cultural position of the locals and does not automatically move towards the centre of the global society. The cultural differences between the outsiders and insiders at the locale influence which perspective in a FLOSS implementation (e.g., economical, educational, social, political, technical) should be prioritised. This decision is a tactic because in the decision-making process, NGO and FLOSS activists all identify and interpret the social problem from their point of view. For FLOSS and NGO activists, introducing and implementing FLOSS denotes a cultural shift of networking the local with the global. They believe that ideas and knowledge are the cosmopolitan valuables, and community building and social networking are the most effective means to engage these social capitals that can be amplifiers in an innovation system. However, the social problems have different meanings to the local. In some places, freedom of information is not the priority. Instead, to endorse the local economic purchase power is on top of any other concerns. Without taking the local interests into account, the design of the information infrastructure, which is out of

context, is likely to be lost in translation. That said, the social problems addressed, presented and represented differently by NGO and FLOSS activists in each local context, are better seen as articulations of the communication and movements between different forms of knowledge and cultural practice. In short, "who provides what for whom" is a crucial question when studying the implementation of FLOSS. There is a dilemma of "translation from whom?"

This dilemma has gradually been noticed by some FLOSS activists who have devoted much time to implementing FLOSS infrastructure in undeveloped/developing countries. In the case of wireless technologies, it is true that wireless technologies are relatively cheap and have all of the technical advantages of simplicity, openness, decentralisation and autonomy. However, when the digital divide is perceived as a social problem for NGO and FLOSS activists, it has actually produced a subtle prejudice invisible to the digital elite. Indeed, some FLOSS spokespersons have shown different opinions on mainstream media policy that "often take the technological configuration of the new media as a 'given' or prefigured system that needs to become more widely diffused to citizens" (Mansell, 2002, p. 408). However, as Mansell also points out, arguments such as Lessig's research (2000, 2001) "does not examine the rhetorical forms that help to sustain the configurations of the new media that are favoured by an influential minority of technology developers and producers" (op. cit.). It is likely that the implementation of FLOSS conversely deteriorates the opposition between the rich and the poor because the poor cannot perceive the digital divide as an urgent problem. It would be a failure of not being able to correspond the local's interests and encourage their motivations.

Is FLOSS a silver bullet for bridging the digital divide? It could be. Compared with other ICT based on proprietary software, a FLOSS-based implementation does provide a better approach to bridging the digital divide from many aspects, particularly in terms of mapping and incorporating local users' requirements and lowering their ICT purchase cost (Lin, 2004b; Wheeler, 2004). However, the degree of empowerment may be counteracted if local users' interests are not fully included in the implementation agenda. So-called "digital independence" and "participatory democracy" would be just a proclaimed allegation in the FLOSS hype, as they are in most ICT advocacy. Having said that, it is not my intention to deny the advantages of FLOSS and its socio-technical impacts. But I would like to point out some blind points remaining in its world wide implementation and deployment. There has been a tendency in the development of ICT to facilitate human activities with more ubiquitous and efficient infrastructure and interfaces to meet users' needs in various areas. Whilst this vision of civilisation sounds promising, the accentua-

tion on ICT's positivity also leads to all manner of delusions and falsehoods. When a newly invented ICT product is praised for its influential potential to empower consumers, it is yet invalid without asking whether a product is usable and useful to users, or without understanding users situated in different cultural and social contexts. This focus on the infrastructure building has misled both the public and the private sectors to believe a set of dominant and monolithic values, such as "efficiency," "modernity," and "improvement" (in the context of the "state-of-the-art"). Users are imposed to accept explicitly or implicitly these values which are fabricated and fortified to meet interests of specific social groups. A solitary identity and socio-technical class is produced to categorise users: to be connected/wired or to be alienated from the digital world; to be mobile or to be outmoded; to be electronic or to be antediluvian. Diverse meanings of "innovation" thus are muted in this dominant socio-technical context. Modern users of ICT de facto have lost their socio-cultural identities, which are grounded in everyday lives. The digital divide issue is also lost in this hype that ICT is the vehicle for democratic participation.

Whilst the emergence of FLOSS broadens the digital divide issue from a level of access to information facilities (hardware) to information contents (software), this extended scope remains the preference of a small group of digital elite. In this regard, I share the opinion of Thomas and Wyatt (2000) that access is not the only important issue for understanding inequality. Instead, it is the assumptions on which diffusion of Internet connection is seen as necessarily expanding and beneficial that should be questioned. In a sociological term, it is more essential to understand the meaning of "access" to the Internet that is interpreted and appreciated differently by different social groups across geo-cultural borders. A crucial perspective to be developed while studying the increasingly prominent FLOSS phenomenon is to examine critically the role of the intellectual and their interactions with the local. It requires a careful examination on the conceptualisation and organisation of resistance to taken-for-granted realities and dominant forms of social organisation, which often goes together with a desire for new technologies. The so-called "digital divide" should be understood as a *situated* digital divide.

CONCLUSION: TRANSFERRING LOCAL EXPERTISE INTO A GLOBAL KNOWLEDGE SYSTEM

This article argues that FLOSS helps developing regional communities by improving ICT capacity and empower-

ing users. FLOSS provides local governments and organisations a shared code base with higher level of security and a dramatic reduction of development costs. FLOSS bridges the digital divide in lessening dependency on proprietary software and securing the potential for developing local relevant software. However, without adequate expertise, after opening up the black box of software technologies, users are still left in a feeble situation and strongly depedent on experts. This is why hands-on training and a well-networked community providing mutual help are necessary in the implementation process, so that participants can learn to read the code, manipulate the code, and work with the code. Here, "the code" does not only indicate software source code, but is more generically referred to the code of knowledge. Whilst open-source code is decoded, so is the formal expertise deciphered. Consequently, software technologies can be challenged, adapted, and ameliorated to satisfy diverse user needs and solve the prolonged usability problem. Nevertheless, this problem will not be solved in a short time. Whilst open source code can be exploited and employed by experts programmers for individual needs, for users, unless they own or access to the expertise as well, the knowledge does not transfer onto them straight away after source code is released. That said, the empowerment of technology is not a natural process. It requires skills and experiences dealing with and translating the rich information into various languages which facilitate wider accessibility to the core of the knowledge system. I suggest that it is crucial to coalesce the local cultures and the technologies and to improve the dialogues between FLOSS developers, implementors and the locals in order to facilitate the implementation process. In so doing, knowledge-deciphering and knowledge-transferring will less likely to get lost in translation. ICT knowledge thus can be more appropriately transferred to and relocated in locals' daily lives. The global problem of usability, hence, can be tackled through the grassroots social networking.

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KEY TERMS

Digital Divide: The digital divide is a social issue referring to the differing amount of information between those who have access to computers and the Internet and those who do not.

FLOSS: Free/Libre Open Source Software (FLOSS), generically indicating non-proprietary software, combines the concepts of free software and open source software. It makes it easier to talk about one movement and not ignore the other, and as such, can be used as a compromise term palatable to adherents of either movement. It also emphasises the libre meaning of the word "free" rather than the "free of charge" or gratis meaning which those unfamiliar with the subject might assume. This all-inclusive acronym has the extra advantage of being non-anglo-centric: the F stands for *Frei* in German while the L stands for *Libre* in French and Spanish, *Livre* in Portuguese and *Libero* in Italian, showing that the concepts and their implementation are not exclusive to the English-speaking world.

ICT: Information and communication technology (ICT) is the technology required for information processing. In particular the use of electronic computers and computer software to convert, store, process, transmit, and retrieve information.

NGO: A non-governmental organisation (NGO) is an organisation which is not a part of a government. Although the definition can technically include for-profit corporations, the term is generally restricted to social and cultural groups, whose primary goal is not commericial. Generally, although not always, these are non-profit organisations (NPO) that gain at least a portion of their funding from private sources.

Social Networking: Social networking describes the process of connecting individuals via friends, relatives, and acquaintances. These networks can then branch out and allow friends to connect with people inside their accepted social circle.

Usability: Usability addresses the full spectrum of impacts upon user success and satisfaction. Usability is accomplished through user-centreed (not necessarily user-driven) design. The usability engineer provides a point-of-view that is not dependent upon designers' goals because the usability engineer's role is to act as the users' advocate.

User-Centred Design: User Centered-Design (UCD) is a software process that seeks to answer questions about users and their tasks and goals, then use the findings to drive development and designs, and improve the usability and usefulness.

ENDNOTES

[1] Here, "usability" serves as an umbrella term that covers generic human-machine interactions (HCI) issues as well as wider accessibility and the digital divide problems.

[2] http://www.eriders.net/

[3] http://www.lincproject.org

[4] http://www.tacticaltech.org/summersource

[5] http://www.tacticaltech.org/africasource

[6] http://www.oreillynet.com/et2004/

Government Procurement ICT's Impact on the Sustainability of SMEs and Regional Communities

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INTRODUCTION

SMEs (small and medium sized enterprises) are a dynamic force for sustainable economic growth and job creation within developed and developing communities (MFT, 2001; NOIE, 2003; BRTF, 2003). SMEs stimulate private ownership and entrepreneurial skills; they are flexible and can adapt quickly to changing market demand and supply conditions; they generate employment, help diversify economic activities and make significant contributions to export and trade. An economy's overall economic health and well-being can be measured by the growth of SMEs-so it is vital to enhance the capacity of SMEs to compete domestically, nationally, and internationally (APPC, 1999).

The sustainability of SMEs is compromised by their struggle to gain a significant share of the government procurement pie, and this impacts on the economic, social and cultural capital of countries and communities and the distribution of wealth. So governments need to foster an appropriate business and policy environment to improve the growth prospects of SMEs (Loudon, 2003). In particular, the implementation of Information and Communication Technologies (ICT) can provide an enabling environment for SME access to government procurement markets (Calarco, 2003).

BACKGROUND: SMEs AND GOVERNMENT PROCUREMENT MARKETS

Definitions of SMEs differ from economy to economy, and are based on specific criteria such as the number of employees, level of assets or turnover. However the economic, social and cultural contributions of SMEs that are common across economies are their ability to (MFT, 2001):

- create jobs with low capital costs;
- create conditions for development and introduction of new technologies;
- function as subcontractors for large corporations;
- adapt faster to the demands and fluctuations of the market place;
- fill marginal areas of the market, which are not targeted by large corporations;
- decentralise business activity and help foster faster development of regions, small towns and rural communities; and
- alleviate the negative impact of structural changes.

By opening up the public sector procurement market to SMEs, governments in Australia, the USA, the UK, New Zealand, and the developing economies are attempting to use their buying power to build the business capabilities of SMEs, foster economic growth, and get "value for money" in public spending (Breen & Demediuk, 2003; BRTF, 2003). Whilst the opportunity space for SMEs in the government procurement market is currently limited in developing countries (Wittig, 1999) and in developed nations (BRTF, 2003; DCITA, 2002), globalisation, the acceleration of technological change and innovation create expanded opportunities for SMEs (OECD, 2000). In particular, the use of ICT is a major driver for improving SME access to local and international government procurement (Calarco, 2003).

IMPACT OF ICTs ON GOVERNMENT PROCUREMENT SYSTEMS

ICTs facilitate the development of purchaser-supplier systems that have been termed e-procurement or e-tendering. In practice, systems can be as simple as providing orders via an e-mail message or as complex as integrated supply chain ordering, delivery and payment systems (Calarco, 2003). E-procurement functionality is about the business not just the technology. The major functions of such electronic systems can range across registration of suppliers; notification of tenders; issuing and downloading of tender documents; receiving and responding to enquiries; submission of tender offers; notification of contract award; and ongoing supply man-

agement (Calarco, 2003). The use of ICT in E-procurement can involve (Wittig, 2002, p. 7):

- procurement planning & budget control;
- tracking supply needs (including demand forecasting, inventory management, etc.);
- preparing catalogues of approved items (e.g., for common use items, framework contracts) and providing information on the buyer's procurement catalogue;
- communicating the buyer's procurement program (e.g., yearly, quarterly) and advertising previous contract awards;
- tracking the solicitation approval process, advertising the buyer's solicitation notices, providing suppliers' access to the buyer's solicitation documents, and buyer/supplier communications on technical and other clarifications regarding solicitation;
- sharing of information in networks of public procurement agencies on topics like: membership, news, public procurement events, common texts on public procurement laws and regulations, regulation guidelines, standard procurement documents and contracts, and standard management and record-keeping forms;
- managing supplier data, like expressions of interest, suppliers' registration and pre-qualification, suppliers' submission of bids, quotations and proposals;
- buyer processing and evaluation of bids, quotations, proposals and buyer communication of award to supplier;
- communications as needed between buyer & supplier prior to closing the contract;
- communications between buyer & supplier on supply management (delivery and progress of awarded contracts, including tracking supplier delivery schedules), and invoicing & payment; and
- data archiving for purposes of audit trail and security.

ICT may improve the functionality of government procurement marketplaces through e-procurement systems that facilitate transparency, accountability and access through an open system; reduce the transaction costs to all parties of doing business by minimising non-valued added activities (telephoning, printing, postage, re-keying, etc.); reduce process cycle times; and provide a platform for competitiveness and growth (Calarco, 2003). While such ICT-based reforms benefit all firms, it should have a more significant impact on SMEs since "…. SMEs have fewer resources, (and) anything that

makes the process easier and lowers the cost of involvement will have a greater relative result for them" (Holden & Dade, 1998, p. 2).

Governments can provide a more level playing field in information access that not only assists SMEs to find and respond to market opportunities, but also acts as an incubator for the uptake of new technologies that can improve businesses generally. In one region the state-of-the-art technology may be the general introduction of e-mail capacity, whereas in another more developed community it may be the ability to make a binding contract over the Internet (Wittig, 2002).

The goal of relative improvement in SME access to government procurement markets requires technology solutions such as aggregated, simplified or standardised access portals, along with good help-desk options and technology and training support (BRTF, 2003). What is also required is a revision of the processes to which the technology is to be applied. If ICT innovations simply embed into an electronic form some existing procurement policies and procedures that inhibit SME access, the problems for SMEs may become relatively worse. For example, the use of larger contracts in government procurement is often driven by the need for greater efficiency. These larger contracts require less staff to manage them and there is a single point of contact for dealing with problems. However the contracts generally result in a reduced number of larger suppliers, effectively ruling out smaller firms and the advantages they potentially bring in agility and focused solutions. Where tender evaluation criteria are geared towards lowest tender price, the perceived innovation, flexibility and quality advantages of SMEs are discarded, as the potential for wider societal and economic community development is lost. SMEs are also disadvantaged where small-scale tenders are left off generally advertised lists, or SME tenderers are required to provide unlimited liability or reach unrealistic experiential or financial pre-qualification hurdles (Breen & Demediuk, 2003).

FUTURE TRENDS

Given the limited success of many ICT-based government procurement initiatives (Breen & Demediuk, 2003; OGC, 2002), in the future full account must be taken of SME perspectives when government agencies are designing new ICT-based policies, processes or initiatives. There also needs to be greater awareness among SMEs of the benefits of the ICT and the "Information Society" and of integrating Internet use and electronic commerce in their business strategies. Awareness, interest and capability of SMEs in relation to ICT-based

procurement systems can be fostered by resource and demonstration centres, training initiatives, pilot projects and encouraging the development of effective and user-friendly frameworks for certification, authentication, transaction security, and preservation of intellectual property rights (IPRs). These imperatives provide a rich source for future research studies into the operationalisation of ICT in an SME context.

CONCLUSION

Where ICT drives improved SME access to government procurement markets through greater transparency and access, they can have a positive impact on the development of economic, social and cultural capital. However SMEs can be further disadvantaged and the sustainability of regional communities compromised where ICT merely embed existing inhibitors of SME access to government business into more efficient electronic forms.

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KEY TERMS

E-Procurement: E-procurement is the business-to-business (B2B) or government-to-business (G2B) purchase and sale of supplies and services that is facilitated by the Internet and is sometimes referred to by other terms such as e-tendering or supplier exchange.

E-Tendering: Another term for e-procurement.

Help Desk: A section that can respond to technical queries by users.

Information and Communication Technologies (ICTS) In E-Procurement: Portals and electronic systems that facilitate registration of suppliers; notification of tenders; issue and downloading of tender documents; receiving and responding to enquiries; submission of tender offers; notification of contract award; and supply administration.

Information Society: A context in which people interact with technology as an important part of life and social organization to exchange information.

Intellectual Property Rights (IPRS): Treats certain intangible products of the human mind as belonging to the creater or holder in legal form such as patents, trademarks or copyright.

Portals (Web Portals): Web sites that give access to a broad array of resources and services such as: e-mail; discussion forums; search engines; and business information.

Small and Medium-Sized Enterprise (SMEs): Small and medium-sized enterprises are socially and economically important, since they represent 99% of all enterprises worldwide and contribute to entrepreneurship, innovation and economic, social and cultural development. Precise definitions that separate SMEs from large enterprises differ between countries and rely on variables such as headcount, turnover and balance sheet size.

How the National E–Strategy Shapes Competitiveness in the Information Economy

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INTRODUCTION

The ongoing discussion on what e-strategy does and what it can do for national information and communication technology (ICT) development has brought up a variety of government functions for the ICT environment, readiness, and usage in a country. The ICT sector plays a key role in furthering the ICT development process. This paper sheds light on the connection between e-strategy and the development of dynamic ICT businesses in Tunisia. The central question is how far e-policies may not only create a supportive environment for ICT, but also contribute to sustained success and competitiveness of ICT firms.

FROM ICT TO COMPETITIVENESS

Tunisia is one of the leading developing countries regarding its achievements in information and communication technologies (ICT) and competitiveness. Recently published comparative indicators illustrate some remarkable performances in both fields. Tunisia is ranked 34 in the Networked Readiness Index (NRI) which covers 82 countries (Dutta & Jain, 2003). The country holds the highest ranking in Africa and in the Arab world. In the Growth Competitiveness Index (GCI) the country is ranked 34 (Cornelius et al., 2003), and in the Microeconomic Competitiveness Index (MICI) it ranks 32nd out of 80 countries (Porter, 2003). With the exception of South Africa, Tunisia's competitive indicators outperform all African and Arab states in the rankings. Also, with regard to government efforts to successfully promote ICT competitiveness, Tunisia is clearly showing the way among poor and middle-income countries (Lanvin, 2003).

The government e-strategy defines the overall framework for national ICT development. In Tunisia the underlying e-policy framework is embedded in the national development plan, currently the Tenth Plan 2002-2006. This intends software and information technology (IT) service companies to play more of a key role in furthering the Information and Communication Technology (ICT) development process both as suppliers of technology at the core of the Tunisian information economy and in-

creasingly as exporters (Ministère du Développement et de la Coopération internationale, 2001). The question is, beyond all the indicators, how far the e-strategy creates not only a supportive environment for ICT, but also contributes to the competitiveness of ICT firms, especially regarding software and IT service exports.

LINKING E-STRATEGY AND COMPETITIVENESS

Through development priorities set by the government e-strategy for the information economy and society, supply and demand conditions for ICT in a country are essentially influenced by the state. According to Lanvin (2003), the influence is more or less direct on four crucial determinants of ICT supply and demand. These are human and financial resources, and domestic and international market conditions. The role of the government changes from directly producing and using technology to indirectly fostering the information economy and society as both facilitator, by providing a supportive environment for ICT, and as leader by providing visions for ICT and its role in social and economic development.

However, the e-strategy integrates a variety of policy areas, and pursues a diverse set of social and economic development goals. Thus, it does not necessarily address the development of a specific economic sector or its competitiveness. The impact the e-strategy has on competitiveness depends primarily on the overlaps between the proximate business environment of firms and the national ICT environment. The more overlaps exist, the more the national conditions achieved and envisaged for ICT can affect the pool of essential input factors including the skills and knowledge firms can draw on and the corporate goals that determine investments. According to Porter (1990), there are four attributes determining the business environment and its eligibility to support the capabilities of firms to develop and enhance competitive advantages. These are factor and demand conditions, the presence of related and supporting industries, the context of strategy, and rivalry.

The sector that is most dependent on the e-strategy regarding the effects of competitiveness is the ICT sector

itself. The role of the government which either directly or indirectly takes part in ICT development has an impact on all relevant attributes of the proximate business environment (Lanvin, 2003).

As public ICT producer and buyer, the government may provide the fundamental ICT infrastructure and generate demand for ICT on the one hand, but may stand also in rivalry to private ICT producers on the other. Therefore a key question is, how much public demand and rivalry to public enterprises may affect the competitiveness of ICT firms (Porter, 1990), especially concerning software and IT service exports.

The more a government moves towards indirect ways of influencing ICT development, the more important is the focus of the e-strategy on improvements of macroeconomic conditions for the information economy, the generation of technological expertise, and the setting of market signals to trigger dynamic ICT businesses (Lanvin, 2003).

THE TUNISIAN GOVERNMENT AS ICT LEADER

Tunisia gave a high priority to ICT in its national development plan (Ministère du Développement et de la Coopération internationale, 2001). In so doing, the government made clear that it is a visible and driving force for technological progress in the country. For instance, Tunisia together with Singapore, Taiwan, and Finland has taken the lead in the international comparison of governmental ICT readiness (World Economic Forum et al., 2003). Regarding ICT usage, the government is also more advanced than many other countries in Europe, or Asia, such as France, Portugal, Spain, Hungary, and India (World Economic Forum et al., 2003).

LAYING THE FOUNDATIONS FOR THE INFORMATION SOCIETY AND ECONOMY

Building the ICT Infrastructure

For the period of the Ninth Plan between 1997 and 2001 the Tunisian government invested $1.016 billion US dollars[1] in ICT infrastructure, including telephone networks, Internet backbone, and other digital communication networks. The Tenth Plan provides $2.070 billion US dollars to advance this process between 2002 and 2006 (Ministère du Développement et de la Coopération internationale, 2001).

Despite these investments, the country still has a below-average position regarding the availability and quality of access to communication networks (World Economic Forum et al., 2003). As with many other countries, Tunisia is still working on the densification of its existing telecommunication infrastructure. However, it is important to note that significant progress has been achieved over the last years regarding access and affordability (Dutta & Coury, 2003).

The number of fixed-line and mobile phone subscribers per 100 inhabitants increased from 6.5 in 1997 to 15 in 2001. Further progress of the network densification can be expected due to the liberalization of the market for mobile communication in 2002 when the monopoly of Tunisie Telecom was broken and a second mobile provider, Orascom Telecom Tunisie, entered the market. The costs of mobile telephony are declining constantly and the number of mobile phone subscribers is increasing significantly. For example, in 2002 there were 400,000 subscribers and by 2006 the government estimates up to 3,000,000 users (Ministère du Développement et de la Coopération internationale, 2001).

Regarding the Internet, Tunisia plays a pioneer role for the region. In 1991, it was the first country connected to the Internet in Africa and the Arab world. Currently there exist 12 Internet service providers (ISP) in Tunisia. The Internet access for individuals and businesses has been improving constantly (*factor conditions*). With 12.83 per 100 inhabitants in 2002, the number of Internet accounts still remains low internationally. Whereas, Tunisia is the most advanced country in the Maghreb region in successfully facing the densification challenge for Internet access (World Economic Forum et al., 2003).

Eventually, the question is how far the priorities concerning the extension of infrastructure to reduce the digital divide on a broad social scale stand in conflict to the infrastructure improvement with special regard to the competitiveness of ICT firms through, for example, policies that support low costs for international communication(*factor conditions)*.

Government Prioritization of Software and IT Services

Public investments in ICT contribute an important share in the overall turnover of the ICT sector (*demand conditions*). The public budget for hardware, software and IT services has expanded continuously. The Tenth Plan intends to increase investment from $668 million to $1.296 billion U.S. dollars between 2002 and 2006. Whereas, the government puts stronger emphasis on software and IT services with an average annual budget extension of 18.6% for services compared to 12.3% for hardware

(Ministère du Développement et de la Coopération internationale, 2001).

Public ICT Production

The government established various institutions to boost the ICT development in Tunisia and to support research and development (R&D) at a time when no private facilities and companies were in the position to take over these tasks of national importance. Eighty percent of software development in the public sector and in public administration are covered by the Centre National de l'Informatique (CNI) (*context of strategy and rivalry*). The Centre des Etudes et Recherche en Télélcommunication (CERT) is active in the field of IT services and software development also for the public sector and public administration. As an exporter it has carried out IT consulting and IT management projects in various African and Arab countries (UNDP & CEPEX, 2004).

According to the advancing information economy in Tunsia, the dominance of public ICT producers might have to be reconsidered (Lanvin, 2003). Whereas, a call for liberalization in order to open markets and growth potentials for private ICT firms has to be seen in a trade-off to other national and sectoral development priorities of the government. An important question in this regard is, which functions and responsibilities of public producers would be appropriate to be transferred to private firms according to their capabilities and strengths?

SHAPING THE MACROECONOMIC ENVIRONMENT

Legal Framework

Tunisia was the first Arab country to join the World Trade Organization (WTO) in 1995. Regarding ICT, the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) is of particular importance. With the standardized Intellectual Property Rights (IPR) protection system, Tunisia is due to witness further integration into global R&D (Dutta & Coury, 2003). Several national IPR-related decrees already exist. These are the trademark decree of 1936, the patents decree of 1956, and the copyright decree of 1994. From January 2005 the country is required to extend product patent protection to types of products not previously patented so extensions of the legal framework can be expected in this regard.

The government has also worked on a legal framework for e-commerce. Several laws have already been enacted. These have been adapted to the concepts on e-commerce legislation of the United Nations Commission on International Trade Law (UNCITRAL) and the European Union (EU) (World Bank, 2002). It is also important to mention the law on electronic signatures and the law on electronic commerce of 2000. Through these laws, Tunisia has achieved a more advanced and comprehensive legal framework for ICT than for example Italy, Portugal, and Hungary (World Economic Forum et al., 2003).

Supply with Capital and Finance

Efficient capital markets are essential for entrepreneurship and investments in the information economy (Raffa et al., 2002). In Tunisia, banks and the vast majority of venture capital companies show in general a preference for investment and financing projects with large enterprises in more traditional Tunisian industries such as textiles and tourism rather than in software and IT services (World Bank, 2002). This is a serious obstacle for the majority of ICT firms in Tunisia (Chaabouni & Mezghani, 2001). The availability of venture capital (*factor conditions*) is an important precondition for innovation and business development. Finance and management consultancy (*related and supporting industries*) can be necessary for the feasibility of large customer projects (UNCTAD, 2003).

Facing the disadvantage regarding the weak capitalization of firms, the government established public venture capital funds. They take part in joint investment projects in the ICT sector together with private finance institutions. By this, the government not only might support the information economy, but this also allows banks and venture capital companies to gain experience in the field of ICT. It has to be seen how far these funds will be used by firms in the short and medium term and how they can help to change the traditional patterns of finance and venture capital provision in the long term. However, such public financial and non-financial business development support (BDS) plays a key role for getting around market inefficiencies and structural obstacles for ICT firms (UNCTAD, 1999).

BDS can have a variety of impacts on the information economy and its proximate business environment. These can be classified as direct measures undertaken to support firms either with capital (*factor conditions*) or project finance and consultancy provided to accompany specific business processes (*related and supporting industries*). Indirect impact derives from the governmental incentives for other industries to invest in ICT (*demand conditions*). For instance, the Tunisian government co-finances upgrades of IT systems in order to increase productivity and the implementation of e-commerce applications to support export businesses. As a conse-

quence, the support policies have effectively promoted ICT investments and high technology absorption in Tunisian firms (World Economic Forum et al., 2003).

TAILORING EDUCATION POLICY

Education plays a key role in the government's e-strategy. For instance, relative expenditures for higher education increased between 1997 and 2003 from 1.27% to 1.80 percent of gross domestic product (GDP). Especially, technical studies have been vigorously promoted. The number of students in ICT-related studies increased from 3,534 in 1997 to 30,260 in 2003 (Ministère de l'Enseignement Supérieur de la Recherche Scientifique et de la Technologie, 2003). Eventually, Tunisia achieved an excellent international ranking—number six—regarding the quality of math and science education (World Economic Forum et al., 2003). This way, the national human resources development in terms of quality and availability of technological expertise supports effectively an advantageous business environment for Tunisian ICT firms (*factor conditions*).

LEADING LARGE PUBLIC ICT INITIATIVES

State of ICT Cluster Development

Cluster formation is an important driver for the productivity and competitiveness of firms. Clusters foster closely linked and efficient relationships (*related and support-*

ing industries) up-stream and down-stream in the value chain, and among firms at the same stage of the value chain (Porter, 1998). Therefore, this is an important feature of the Tunisian e-strategy. By building technology parks, the so-called "technopôles", the government follows the approach of the United Nations Industrial Development Organization (UNIDO) for International Business Incubation Systems (IBIS) (UNIDO, 2004).

The major project is the technology park, Elgazala, in Ariana which was established in 1999. Until 2003 the number of Tunisian and foreign ICT firms located in the park increased to 40. Similar "technopôle" projects are about to be launched over the coming years with Sakiet Ezzit in Sfax and Hammam Maarouf in Sousse.

Public research institutions are closely linked to the technology park. The Ecole Supérieure des Communications (Sup'Com) and the Institut Supérieur des Études Technologiques en Communications (ISET'Com) play a key role in driving innovation and fostering partner companies (ITU, 2002). For example, since 2001 ISET'Com is establishing enterprise incubators in order to promote entrepreneurship in the information economy. It links research, higher education, and financial and non-financial BDS.

As outlined above, despite the governmental BDS policies and the beneficial environment that a "technopôle" offers, with the absence of sufficient finance and capital provision for the information economy on a broad basis, ICT cluster development lacks an important condition for sustained success of ICT firms (UNCTAD, 1998).

Table 1. Achievements of Tunisia's e-strategy

Target dimension in the proximate business environment of ICT producers	e-Strategy objective	Achievements regarding competitiveness: Fostered advantages
Role of the government	Macroeconomic environment: legal framework for ICT	Advanced implementation of intellectual property rights and e-commerce legislation
Factor conditions	Laying out the ICT infrastructure	Sufficient access to telecommunication networks and low costs for national telecommunication
Factor conditions	Education policy	Excellent technological expertise and high availability of human resources
Demand conditions	Expenditures for ICT	Increasing prioritization of software and IT services

Table 2. Challenges for Tunisia's e-strategy

Target dimension in the proximate business environment of ICT producers	e-Strategy objective	Challenges regarding competitiveness: Reversing disadvantages Developing advantages
Factor conditions	Laying out the ICT infrastructure	Moving from network densification to advanced communication technologies
Factor conditions	Macroeconomic environment: venture capital for ICT	Triggering the resolution of rigid structures in capital markets
Related and supporting industries	Leading large national ICT initiatives	Promoting cluster development through non-distorting business development support
Context of strategy and rivalry	Moving from producing to facilitating	Lowering public ICT production along with the advancing development in the information economy

CONCLUSION

The ICT environment in Tunisia contributes to the competitiveness of ICT firms but also challenges them, especially regarding software and IT service exports. Based on the issues presented in the course of this case study, Tables 1 and 2 suggest some fundamental achievements and challenges for future e-strategy formation that might consider more competitiveness impacts on ICT firms. Again, the strategic choice of the government has to be seen in the context of national development priorities. The trade-off between social and economic development goals and possibly conflicting development goals in different sectors will result in the decisions of policy makers. Whereas, the priority has been set—software and IT service exports.

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KEY TERMS

Digital Divide: The digital divide is the discrepancy between people who have access to and the resources to use new information and communication tools, such as the Internet, and people who do not have the resources and access to the technology. It can exist between rural and urban areas, between the educated and uneducated, between economic classes, and between more and less developed nations.

E-Strategy: The e-strategy defines the overall framework for the national ICT development. It has a social and an economic dimension. It consists of e-policies which concern the ICT environment, and ICT readiness and usage of three stakeholders in ICT: individuals, businesses, and governments.

GCI: The Growth Competitiveness Index (GCI) aims to measure the capacity of the national economy to achieve sustained economic growth over the medium term, controlling for the current level of development.

ICT Sector: The ICT sector is a combination of manufacturing and service industries that capture, transmit and display data and information electronically (OECD, 2003).

MICI: The Microeconomic Competitiveness Index (MICI) aims to assemble textured measures of the competitive environment of a nation.

NRI: The Networked Readiness Index (NRI) measures the degree of preparation of a nation to participate in and benefit from ICT developments.

ENDNOTE

[1]   The exchange rate of Tunisian dinar to US dollar of Tuesday, 31st December 2002: 1.00 US dollar = 1.37250 Tunisian dinar.

ICT Aided Education for People's Empowerment

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INTRODUCTION

It is widely recognised that knowledge and education are the key factors that need attention to eradicate poverty. Yet the poorest sections of the community have the least access to conventional means of gaining knowledge and education. Thus we are witnessing a polarized world where on the one side we would find an "information elite" and on the other, the digitally illiterates or excluded. Such a position is very apparent from the world map of the Internet users (Zooknic, 2003). This paradox is common in the developing countries across the globe. The gap between population groups and accessibility to knowledge resources is widening as the awareness, information, as well as education and skill development efforts fail to reach the right target. The major reason for this lies with the present system of knowledge dissemination and not with knowledge resources. India, where literacy is still very low, cannot simply rely on printed books for effective education and knowledge dissemination.

Therefore to bridge the gap between the target disadvantaged population and the knowledge resource, appropriate methods of communication are needed so that the shortcomings of the print and audio-visual media, especially lack of participation, are mitigated. In this regard the digital media and information and communication technology (ICT) have immense potential. This is one of the primary concerns of practice of Community Informatics (Marshall et al., 2003). Community Informatics emphasises that the method of its deployment is particularly important rather than the technology itself. In this article we will describe a model for the community informatics approach that we followed in order to harness the digital media for education, health awareness and development in a specific location in India.

HOW THE PROJECT STARTED

The concept of the project started with our conviction in "ICT-mediated human network creation to complement skills and assemble resources for development." It started with the following questions:

- What is appropriate model for using interactive media for education and awareness?
- How is it best to tackle the challenge of removing people's mental barriers (especially in the developing countries) to ICT?
- Where Internet bandwidth is still a problem how is it possible to spread the effective use of ICT using the existing human network?

After their belated entry, Personal Computers (PC) and communication facilities are now becoming more available in urban and semi-urban areas in India. However the PC has not generally been considered as an information dissemination tool. This is particularly because of two reasons: (a) people in many cases consider the PC as a sophisticated device or a device for playing games, and (b) there is not enough content that presents knowledge or information suited to local needs. Therefore our first priority was to project the PC as an easy to use "information appliance" for the community. We targeted the stated goal with the following directed efforts:

- Low cost media development using student resources to reach out to people for basic education, health and environment awareness; and
- Creating awareness by involving stakeholders in both developing and promoting the media.

Consequently we created a forum where like-minded NGOs (Non-Government Organizations), ICT experts, students, and schools exchanged views and collaborated to adopt the digital media that would add value to the current method of knowledge dissemination. We started with a consultative workshop with all the stakeholders and fixed the following plan of actions:

- Developing interactive multimedia content as a low cost alternative for awareness and education;
- Promoting the content to the grassroots community through the NGOs;
- Developing Community Information and Learning Centers where ICT activities could be conducted; and
- Promoting the creativity of student community for development of such media.

It was decided that emphasis would be placed on the design of content so that it provided more interactivity in using the media, participation of target groups in realizing the media and lastly development in low denominator technology so that it ran on any platform or machine. Appropriate guidelines were prepared for this purpose.

PARTNERS AND THEIR ROLES

This project evolved through collaboration with various strategic partners that are listed below with their respective roles.

Grass Roots NGOs

There are many NGOs that are already engaged in promotion of education, health and other developmental activities related to local needs. Therefore they are often more acceptable to the community and more likely to have rapport with members of the community. Their role as partners was to extend the community reach quickly and to provide advice on the subject matter, design, approach and language of the digital content. Our long-term goal was to empower the NGO's and the community so that they could initiate their own content development as well as set up a Community Information and Learning Centre in their locality.

Schools

Schools being the centre of education in the community can act as a crucial bridge for the underprivileged. Schools can be the first place to introduce Digital Media-aided learning. If ICT can make leaning more inter-

esting and joyful, dropout rates could be reduced with the possibility of inducing others into a positive learning cycle.

TECHNICAL EDUCATIONAL INSTITUTES

There are many technical institutions in the urban areas of India. The students from these institutes need on-the-job experience and scope to work on projects to exercise their skills. We organized the necessary facilities to support such student projects in the community. We directed our efforts to enthuse the students to work for a social cause and to work on projects having practical utility rather than on dummy academic exercises. Our volunteer list is growing.

PROJECT DESCRIPTION

The project did not start with a rigid plan. This was a learning exercise for all involved and the project grew out of an evolutionary cycle of interaction. The methodology evolved through interaction with the stakeholders. The main phases of the project are described below.

Initiation Phase

The project was initiated with a digital conversion of a booklet that was developed by one of our partner NGOs to teach students basic language skills. The booklet was nicely created and adapted to local needs and context. It contained pictures relating to Disaster Preparedness drawn by local students. However because of the colour illustrations the printing cost was high and only few copies were prepared. When we enquired for an extra copy we found that the NGO lost the master copy itself.

We got hold of one old copy and converted it in a digital form with animation. Then we facilitated a process to allow the digitisation to be demonstrated at a local school. The impact was simply fantastic. Convinced by the approach, community members, the NGOs and students now want more such digital presentations. This demonstration also made other NGOs interested in the project. Thus without any persuasion we were able to convince people about advantages of digital media.

Group Formation Phase

Realizing the emerging need because of the digitisation experience we started evolving a work strategy. This led to formation of technical resource group (TRG) compris-

ing of some like-minded resource people (ICT experts, educationists, professionals and students). The TRG essentially represented the human network whose responsibility included preparing the basic design of the program, interacting with various stakeholders and assessing their need. The TRG ultimately became the prime facilitator of the project.

After constituting a TRG, we started selecting partners at the implementation level. Following a facilitated brainstorming session, a Field Resource Group (FRG) was formed. The FRG had responsibility to analyze the local needs and come up with the ingredients for contents (storyboard, pictures, and data). This helped the TRG to prioritize the content development plan and to choose an appropriate development methodology.

Content Development

Content development requires subject matter expertise, graphics designing and programming. Normally assembling such a team would be a costly affair. Therefore we adopted a model whereby FRG provided the subject matter expertise and the technical students provided the programming expertise. The graphics expertise came from students and other talented people.

Locally relevant content was developed using a low-cost technology model and user-friendly template provided by the TRG. This facilitated fast production to cope up with the growing requests. Although possibilities were many, some of the innovative endeavours that we have undertaken are mentioned below:

- **Simple digital content:** To make learning and awareness interactive and appealing, a series of simple digital productions in local language with animations were being developed. This covered subjects like health promotion, environmental awareness, and literacy.
- **Sabda Sanchari:** This was a low-cost speech communicator for the speech and hearing impaired persons. It used voice recording of some common words. The user could select any of these to form sentences and narrate their wishes through spoken words.
- **Quiz maker:** This program was targeted to build a community of learners. It allowed a participatory quiz game where anyone could add questions and play with local customization. Tremendous interest has been shown wherever we demonstrated this product.

Technology and Equipment

We selected software technology that could be demonstrated in virtually all the places where a computer was available. Even where there was no computer the presentations could be packaged for demonstration using a Video CD Player. The following equipment was used:

- a PC for development;
- Laptop for presentation;
- LCD projector for display;
- a portable video camera; and
- a screen.

Promotion

The uniqueness of our project is that there was no extra effort required for promotion. Because we adopted a participatory approach, ownership of the stakeholders was created right from the beginning. The FRG played a crucial role to promote the content in their locality. Sending the student developers to demonstrate their own work with the help of the FRG further ensured promotion. There was less of an "ice-breaking" problem as the language and context were absolutely local.

Our main thrust was to trigger energy by bringing together the stakeholders, various people and organisation from every cross section of society. In this non-profit work our objective was to reach the maximum number of people, investing a minimum amount of time and money. Subject experts were consulted on how to develop the digital content for particular subjects. Inputs were given to the students with ICT skills who volunteered to develop the content. Thereafter, field-testing was done for different modules prepared for various target groups. Feedback was taken and the necessary alterations were made. We ensured that everybody could contribute his or her knowledge and information to enrich the content. Thus the project met the needs of indigenous digital content or applications developed in the local language and context to bridge the gap between knowledge and target people.

IMPACT

In this pilot project we wanted to establish a model for ICT usage, development and promotion. Within a period of six months and with the initial seed funding support from ITU, the results achieved shows the merits and the potential of the model. Following are the measurable indicators:

1. For the first time many stakeholders of the development sector realised what could be done with a personal computer other than using it for playing games or for printing documents. For example, many NGOs that used to use their PC for mere report

writing are now using it for training, awareness, etc., using simple PowerPoint presentations.

2. Teachers and students admitted that ICT-aided education or awareness could be far more effective than traditional means alone. Subsequently, they began seeking ways to participate in the promotional work and in turn enriched their learning process.

3. Approaches like the digital quiz for awareness became tremendously popular among students because they have seen the similar quizzes on TV as a passive observer. Such an approach gave them the chance to be an active participant, which would have never been possible otherwise. Students as well as teachers began requesting repeated and ongoing awareness camps facilitated by this type of novel approach.

4. Quality control and regular upgrading of content is ensured in the process because of ongoing feedback and user involvement in the development process. The participatory approach in content development generated tremendous interest among the stakeholders, who took pride in showcasing the content, which has some contributions from them.

5. The students involved in developing the content were very enthused when they saw their work had been used for some finite purpose.

6. Confidence was built among many NGOs who realised the need for a community information and learning centre (CILC) as the potential to increase usage of ICT. They began gearing up to turn their existing centre into a CILC. They have started activities like the restoration and documentation of the local resources and heritage with the help of ICT.

The most important result of our initiative that really surprised us was the spontaneous involvement and tremendous commitment of all the stakeholders. This has been possible due to the participatory approach from the beginning. So far six NGOs are working in tandem with us to reach out to at least 1,000 students. In this initial project we were not able to conduct intensive campaigning activities in rural areas. However we believe this project should provide additional promotional benefits for extension into such environments.

The pilot project demonstrated the conceptual sustainability of the approach. Many more partners are interested in participating in our program and a lot of locally relevant content has been developed within a short time frame. In the process we have facilitated the development of a user network.

Although it is a low-cost model for using ICT, it may not be financially sustainable in a shorter time frame. Therefore, longer duration financial support is needed for seeing the true benefit of the effort. Commitment, developing trust partnerships, involving the students and users for developing low-cost digital content, innovative design guidance forms the foundation of this model of using ICT for development.

LESSONS LEARNED

Initiation of any new concept is bound to face hurdles and hindrances. From what we have experienced, promotion of ICT in India is not an easy task because of many difficulties. Because of low literacy levels, there is a huge mental block to the use of ICT amongst rural people. This needs to be tackled appropriately. Infrastructure limitation (Internet and telephone access) is a major obstacle in the promotion of ICT applications in many areas. The cost of ICT equipment is still prohibitive for many schools and NGOs. However there are also situations where the PCs are under-utilized or not used at all due to lack of awareness and training.

The following are the lessons learned from this project:

1. Our most explicit learning was that once technology is introduced in a participatory and democratic fashion, it is going to sustain and propagate on its own.

2. ICT cannot be imposed from outside. The stakeholders must accept it in order to grow natural ownership.

3. A participatory and innovative management model as piloted by us, if nourished properly, will pay returns in longer run.

4. A collaborative approach and learning community facilitated by ICT can help to fight the resource crunch.

5. The conventional approach like donating computers and other accessories does not work (at least within the area where we have interacted). The computer collects dust and lies unused for want of appropriate content.

6. An Internet-based solution for ICT promotion does not work for the rural areas where connectivity and cost of connection are still problematic. Therefore hybrid solution (CD-ROM + Internet) would be more suitable for such situations.

Technology alone cannot bring change. What matters is how the technology is promoted. We felt the

Figure 1. Phase model of access (van Dijk, 2002)
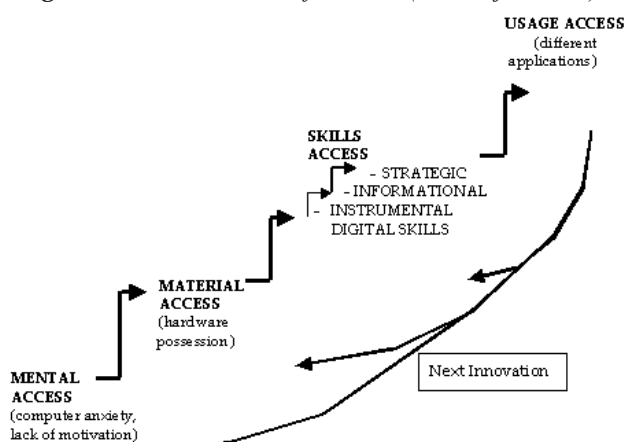
"phase model of access" provides an appropriate conceptual foundation in this respect.

PHASE MODEL OF ACCESS

While discussing the Digital Divide, a "phase model of access" has been suggested (van Dijk, 2002). This model distinguished four kinds of access stages: (a) mental access, (b) material access, (c) skills access, and (d) Usage access. These stages are successive, cumulative and recursive as shown in Figure 1.

Often policies and implementations for meeting the digital divide concentrate on the material and skill access part of the above model. "Clearly, public opinion and public policy are strongly pre-occupied with the second kind of access. Many people think the problem of information inequality regarding digital technology is solved as soon as everyone has a computer and a connection to the Internet. The first kind of access problem, the mental barrier, is neglected" (van Dijk, 2002). Our experience is in concurrence with this view. Therefore our effort started with tackling the issue of "mental access" as shown in Figure 1.

DISCUSSION

It is difficult to overstate the importance of education to development. Empirical research confirms that education makes a substantial contribution to increased agricultural output and labor productivity. Indicators suggest that education leads to the accumulation of human capital, which is a necessity for increasing incomes and sustained economic growth. The social rate of return of primary education is estimated to range from 18 to 25

percent in developing countries (Psacharopoulos, 1994). For an individual, the rate of return would be much higher.

Naturally therefore it is important to develop appropriate strategies for education. Despite all the technological developments and philosophical approaches to learning to date, the nature of imparting basic education, particularly in the developing countries has not changed much. It is still in the "sage on the stage" mode and rote learning is yet as common as it was in the past. On top of this looms large the problem of poor infrastructure, shortage of teachers, paucity of funds, and ever increasing number of students. The situation is not uncommon in other parts of the world, too (Kerrey, 2000).

In order to tackle the problem new methods that leverage Information and Communication Technologies (ICT) need to be adopted. Yet it is well recognized that providing an ICT infrastructure does not guarantee learning and education (Banerji and Scales, 2004). In an InfoDev Symposium Seymour Papert observed, "The current strategies followed by international organizations with the intention of adapting learning to the increasingly digital knowledge environment are fundamentally flawed." He went on mentioning the flaws of scale: "attempts to 'close the digital divide' are too often like climbing a tree as a first 'step in the right direction' to inter-galactic travel. More fundamental is the persistence of a conceptual framework that simply does not take account of the real power of the technologies or of the real needs of a global world" (Papert, 2001).

Against this backdrop we undertook this pilot project in West Bengal, India. We adopted a bottom-up approach by empowering people so that they used ICT resources spontaneously to meet their local needs. The results prove the effectiveness of our approach-"ICT-mediated human network creation to complement skills and assemble resources for development."

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KEY TERMS

Community Informatics (CI): CI is the application of information and communications technologies (ICT) to enable community processes and the achievement of community objectives including overcoming "digital divides," both within and among communities (Marshall, 2003).

Information Appliance: Webster's New Millennium™ Dictionary of English *defines "Information appliance" as* a handheld computer for accessing the Internet and possibly e-mail or telephone communication. With the pervasive nature of computing usage, the term "Information Appliance" refers to a hardware/software combination that connects a networked user with specific information sources. The report on the National Information Infrastructure (NII) rejected the term computer on the grounds that it puts too much emphasis on computation. The report suggested the term information appliances be used instead for systems that support communication, information storage, and user interactions (NIST, 1994).

Phase Model of Access: According to this model, the "digital divide" is concerned with the multifaceted concept of access. Possessing a computer and a network connection is the most common meaning in the context of digital technology. However, according to van Dijk this only refers to the second of four successive kinds of access as given below (van Dijk, 2002):

- **Mental access:** Lack of elementary digital experience caused by lack of interest, computer anxiety and unattractiveness of the new technology;
- **Material access:** No possession of computers and network connections;
- **Skills access:** Lack of digital skills caused by insufficient user-friendliness and inadequate education or social support; and
- **Usage access:** Lack of significant usage opportunities or unequal distribution of them.

The authors suggest that all kinds of access are continually moving. In doing this some inequalities are growing while others diminish.

ICT and Developing Social Capital

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INTRODUCTION

Regional Overview

The Gulf Savannah region (Invest Australia and Gulf Savannah Development, 2003) of north Queensland covers 186,000 square kilometers, an area 80% the size of Victoria. The population of 8,000 live in small towns or Aboriginal communities dispersed across the region and on the large cattle stations and mine sites.

Traditionally, the region has relied on cattle, mining, and fishing for its economic base. Tourism is now fast becoming the leading industry for the area, with around 60,000 plus travelers a year visiting the region. While the basis for this assessment is partly anecdotal and gleaned from local government calculations, a recent study (Greiner et al., 2004) arrives at a figure of around 22,000 visitors per annum for two towns (Karumba and Normanton) in one Shire (Carpentaria). The Savannah Way, a themed adventure-drive linking Cairns on the eastern seaboard with Broome on the Indian Ocean traverses the Gulf Savannah region and was recently launched by the federal Minister for Small Business and Tourism, the Hon. Joe Hockey MP. This destination is now attracting an increased visitation, estimated to be around 14% (Sutcliffe & Olsen, 2004) and provides potential niche enterprise opportunities for small business in the communities.

The beef road network developed by the federal government of Prime Minister Bob Menzies during the 1950s provides a skeletal transport framework for freight, stock, and people, but many sections are rendered impassible during the annual wet season. The road from the east coast to the largest town, Normanton on the Gulf of Carpentaria, a distance of some 700 km, was only sealed in late 2000. The western Gulf, however, is still isolated in the wet season, with the unsealed roads becoming impassible. In the past, long distances and poor roads inhibited travel across the region, and in many communities, vehicle ownership remains low, with more than 20% of dwellings having no vehicle (RIRDC, 2004). Air services link the major Gulf centres with the east coast and the major mining town of Mt. Isa. Until 2002, the cost of air travel was prohibitive and beyond the means of most residents, however, the route is now subsidised by the Queensland Government in order to make the service more accessible for the community.

Before 2001/2002, Gulf telecommunications relied on antiquated and difficult-to-maintain land lines that were frequently damaged by fire and failed in inclement weather. Power supplies were unreliable, with brownouts a common occurrence, leading to equipment damage and failures. Use of ICT was limited, and few residents owned or could use a computer. In 2001, areas of the Gulf were reported as having the lowest proportion of people using computers at home, with less than 5% indicating usage (RIRDC, 2004). Historically, the limited transport infrastructure and the lack of reliable telecommunications and power services presented major barriers to development of the regional economy. Small business, local government, and essential services survived year to year with little change in ownership or business operations.

Inadequate communication, isolation during the wet season, and the long distances to travel over poor roads led the region to be regarded as a frontier outpost by governments of all levels and political hues for decades. To an extent, this isolation has shaped the way the communities regard governments and bureaucracies, creating a spirit of self-reliance and a measure of cynicism in response to government overtures, a factor to be considered for an e-democracy program in the region.

Demographics and Socioeconomic Features

The socioeconomic condition of the Gulf ranks it as one of the more disadvantaged regions in Australia. As reported in the *Social Atlas of Rural and Regional Australia* (RIRDC, 2004), incomes are lower than the state average, there is little secondary industry, and there is a dearth of investment capital. Home ownership is 20% below the nonmetropolitan average, and there is a heavy reliance on public housing. Unemployment is high, with a dependence on the Community Development Employment Program and on government funding, grants, and subsidies. Recent data indicate the number of people on income support and pensions exceeds wage earners in several centres (ABS, National Regional Profile, 2004). Education standards are below par with those of urban areas, with schooling to Grade 10 available in just two centres. Due to the remoteness of the region, locally delivered training is difficult to access. Accommodation for rental is in short supply, with privately owned dwellings rented being more

than 20% below the nonmetropolitan average (RIRDC, 2004), which is a hindrance to business development and expansion and results in overcrowding in some areas.

Community Social Capital

Gulf Savannah Development presented a detailed evaluation of the social capital of the Gulf region at the 2003 SEGRA (Sustainable Economic Growth for Regional Australia) conference (Sutcliffe et al., 2003). Isolated for decades and with a small population, informal networks between family and neighbours were vital for coexistence and support in times of need. As a result, the bonding social capital that developed between families and neighbours of the small communities is very strong. This has been further reinforced by the lack of fluidity in population composition, with new arrivals largely engaged to carry out specialist roles as teachers, police, and local government executives. This social environment gives strength to individuals within the community but is not necessarily conducive to acceptance of change or innovation. Newcomers not privy to the body of shared knowledge and experience feel like outsiders, a fact raised by participants at a series of capacity-building workshops delivered across the region by GSD during 2003.

The bridging social capital or the links to and between organisations and groups tends to reflect the close bonding within the community. Each centre supports a number of small organisations comprising groups of like-minded people, often with the same key members. A common complaint is that the same people attend all the meetings and do all the work.

On the other hand, the linking social capital, the hierarchical and institutional networks from the region to external agencies, institutions, and bodies of influence in areas of higher education, professional groups, commerce, and industry require strengthening to broaden the sources of information flow to the region.

The implications for governance, regional competitive advantage, and business development were clear. To address this imbalance, GSD turned to the use of ICT as a tool to encourage communities and businesses to develop networks outside the region, to interact with governments and organisations with a view to generating knowledge of and trust in institutions beyond their immediate environs.

Existing Regional Governance and ICT

The level of trust within a community can be an indicator of the social capital of that community, whether trust is viewed as an element of social capital or as an outcome of social capital (Productivity Commission, 2003). All tiers of government have a role to play in building the social capital of a region, a key aspect of which is to build trust and confidence in governance at all levels. In the Gulf, Commonwealth and state agencies do not have permanent offices, apart from police, courts, health, and education personnel, and they are essentially outsiders looking in. For the most part, the local population sees them that way, and interaction between residents and the higher levels of government is sporadic.

Governance is essentially delivered by the five Gulf region Shire Councils. Populations are small, ranging between 350 and 1,800 people, resulting in a low rates base and limited resources, which makes governance and community development over vast areas difficult.

Traditionally, Council activity concentrated on the three Rs—roads, rates, and rubbish. These functions are being added to as Councils play an increasing regulatory role in planning, public health, and the environment, and in developing management responsibilities in the whole area of community and social development, such as health, alcohol and drugs, community safety, and transport infrastructure (House of Representatives, 2003).

As a result, increasingly, the Councils in the region are being called upon to deal with high-level interaction with State and Commonwealth Governments, private enterprise, and the broader community. This has dramatically raised the performance bar for elected representatives and local government employees.

The Gulf local governments have reasonably sophisticated and well-managed IT communication systems for internal communications and external communications with agencies. However, e-communication between the Councils and the wider Gulf community are not advanced, with reliance on more traditional means of contact, such as newspapers and public fliers.

Currently, local government use of ICT to link with the community involves basic information provision but does not extend to development of e-democracy or any form of citizen involvement, such as surveys, data gathering, etc. It is an untapped resource for the ongoing development of social capital in the future.

WINDS OF CHANGE

Post 2000: What a Difference a Road Makes

The final sealing of the 700 kilometres of road between the Gulf region and the east coast created a reliable, almost all-weather, physical link between the Gulf communities and the major centres of Cairns and Townsville, and that had a profound impact on visitation to the area. Data from the Main Roads Department road counters between two of

the northern Gulf towns indicated an increase of 70% usage in the first few months. The Gulf immediately became more accessible; there were increasing numbers of travelers, with visitation extending over a longer period each ensuing year. The psychological barrier to traveling to the region was steadily being dismantled.

Residents were now readily able to travel out of the region, and business and tradespeople from outside the area could deliver services faster and with less wear and tear on vehicles. This had an impact on local businesses, forcing them to be more competitive. With the greater mobility of local residents, local businesses found themselves competing with their counterparts in larger provincial towns. This presents a challenge in any region, and those unwilling to face it generally vacate the field and leave opportunities for newcomers.

Telecommunications Revolution: Networking the Nation

When the Australian Government sold almost 50% of its stake in the national carrier Telstra, a proportion of the proceeds was channeled into a program to deliver more equitable telecommunications services to remote, rural areas. This program, Networking the Nation (NtN), was a catalyst for change. In 2001/2002, Gulf Savannah Development applied to NtN for funding to deliver mobile phone technology to the five key towns across the region. Additionally, for those people outside the limits of mobile phone coverage, subsidies were available for satellite phones and through a one-off offer made by Telstra and IBM, people could purchase computers and connect to broadband at a very low cost. Over 170 properties in the region took up this offer. The satellite phone subsidy will be available until 2007.

The Queensland Government also embarked in previous years on a program of community engagement, establishing regional community forums for residents along the eastern seaboard. In 2001, GSD sought to use its networks to develop a similar forum, a Gulf E-Forum, based on the Internet as a means of communication. GSD used funding available under the Queensland Community Skills Development Program to design an e-democracy project, which involved creation of an interactive Web portal (www.the-gulf.info) and basic training for Gulf residents in ICT, Internet, and e-mail use.

One of the key findings from the project was the presence of a significant number of people with no ICT access, who were not computer literate and lacked keyboard skills. This digital divide needed to be addressed. To move toward meeting this challenge, GSD is delivering a "Technology Survival Skills" program funded by the Queensland Government, which encourages those people without a computer to join small social groups to learn basic skills in ICT technology. This will enable them to access the public Internet services in each town.

IMPACTS AND OUTCOMES

Community Engagement

Improved communication is overcoming the tyranny of distance and counteracting isolation in business, governance, and social life, providing avenues for expanding networks and broadening the knowledge base for individuals and communities. This changes the dynamics of communities and challenges established views and platforms.

In terms of the regional economy, businesses have greater confidence to compete on a more level footing in a wider global market, with distance no longer being the huge barrier to access knowledge, trading, and markets. Likewise, governments can more readily access residents and organisations, which were previously too far away to contact or interact with on a regular basis.

In the short term, we are starting to see citizen engagement at a basic level—increased use of e-mail, involvement in business forums, posting articles and calendar events, and responding to news items on the Gulf Web portal. There has been limited community input with regard to government service delivery and service requirements, e.g., in areas of health and telecommunications. Agencies have posted news items about future visits and services, and there has been a positive response to these. However, at a more advanced level of being able to influence policy, the uptake is relatively slow. For example, a survey on the Web site seeking views on the sale of the remainder of national telecommunications carrier, Telstra, a hot topic in the national media, attracted minimal response.

Businesses are using e-mail and the Web at a more sophisticated level and more frequently, with e-commerce becoming the rule rather than the exception. E-marketing and packaging of tours and taking bookings over the Web are all now commonplace, and many Gulf businesses have their own Web sites.

Changes to Social Capital Networks

In the relatively short term, we have seen practical changes in the way people communicate, a willingness to challenge the status quo and seek better services, especially in ICT. Businesses and residents are seeing the value in networking and linking to people, regions, and organisations outside their towns and shires.

Networks are developing slowly, such as the Savannah Way Visitor Information Centre (VIC) Cluster, which will provide a link for the Information Centres and tourism businesses across the Gulf region and into the Northern Territory and Western Australia. Evidence of change includes the following:

- Efficiency in business through small business banking, faster ordering, and bookings
- Enhanced competitiveness in business, as tourists and travelers have access to local operators' information on the Web
- Improved flow of information, as increased use of e-mail cuts costs of operations and overcomes slow mail delivery
- Interaction with government and agencies has been enhanced as the flow of information from the region has increased
- Improved access to global information with many businesses now trading on the Internet

FUTURE ACTIONS AND OBJECTIVES

Future activities and trends will see the region building on the changes taking place:

- Continuation of development of the concept of a community e-forum and e-governance for the region through the Gulf Web portal (www.the-gulf.info) and surveys and chat rooms.
- Identification and support for local champions to act in a mentoring role and ongoing skills enhancement to help bridge the digital divide and at the same time ensure that the traditional forms of communication are retained.
- Increased involvement of local elected representatives in community forums, more citizen engagement and online debate, and encouragement of their use of ICT to disseminate their views on local issues
- Continuing to build the social and economic capital of the region.
- Linking the e-forum to regional development processes, business development, and citizens' futures to ensure ongoing and sustainable capacity building—e.g., encouraging Gulf residents to engage with the Queensland Government's "Action Tracker" for the Gulf Regional Development Plan (GRDP). The Action Tracker is linked to the Gulf Web portal and enables any person to access the Regional Plan and check on the extent of work undertaken by government agencies to deliver the planning strategies.

SUMMARY

The work accomplished to date identified an existing digital divide between those with computers and those unlikely to have ready access to ICT. As we progress down the path of e-governance and e-commerce, the need to build the capacity of all residents to access the new technology is paramount if we are to ensure equality of access in a democratic society.

Improvements in ICT infrastructure teamed with the delivery of training and capacity-building programs to encourage people to maximise benefits from that infrastructure are paying dividends across the region. From our observation, Gulf residents are using ICT to a far greater extent to access knowledge and relay information and comments on a range of issues. Communities and businesses are expressing a preference to interact with all levels of government and conduct business by e-mail and Internet rather than by traditional telephone or postal services.

The social capital of communities will transform as residents become increasingly confident in the global environment and have the knowledge and skills base to deal with external agencies, governments, and institutions. This is a process of empowerment and a positive influence for the region, setting the community on the road to e-governance, e-commerce, and an increasing capacity to be innovative and have the assurance to build community enterprises.

ICT is enabling communities to be more competitive, broadening horizons, contributing to community debate beyond their immediate region and, consequently, playing a role on a far bigger stage.

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KEY TERMS

Capacity Building: Building the skills, commitment, and confidence of community members to develop networks to influence what happens around them in their environment and give them the capability to contribute to shaping and planning their community's future.

Citizen Engagement: A two-way process through which a government or agency can develop an understanding of citizens' concerns and needs and respond to them, conversely enabling citizens to develop an appreciation of how they can positively contribute to and influence the future of their community and region.

Competitive Advantage: Defines a place's or region's attribute(s) with the potential to place it in a leading position in any field (generally used with regard to commercial or economic activity), such as a natural or environmental icon that may give a region a competitive advantage in terms of tourism, or a mineral deposit in terms of mining. A region or place needs to identify and capitalise on distinctive assets and capacities to realise its competitive advantage.

Digital Divide: The gap created between those using ICT and those who do not, for a range of reasons, including a lack of access to ICT as a result of social or economic factors; lack of technical and keyboard skills to use ICT; lack of basic skills or computer literacy skills to understand the requirements and interpret the information of ICT.

E-Democracy: A qualitative term to describe the use of ICT as a medium in which to engage the community to participate in and contribute to the governance process generally, and to facilitate and enhance the capability of a citizen to have a say in the impact of governance on themselves and their communities.

E-Governance: A term to describe the delivery of the governance process using ICT rather than conventional and traditional means.

Regional E-Forum: A community and citizen engagement process linking government agencies and community, using ICT as the means of communication, and extending across and involving a region.

ICT and Distance Learning for Agricultural Extension in Low Income Countries

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INTRODUCTION

About 2 billion people in low-income countries are dependent upon smallholding farming for their livelihoods. These are among the world's poorest people. Most of them lack land tenure and farm in regions with limited land and water resources. Many must cope with drought, desertification, and environmental damage caused by failed land reforms, large-scale monocropping, overgrazing, logging, destroyed watersheds, and the encroachment of new pests and diseases. They use only the most primitive of tools and they lack the knowledge and skills to improve their farming methods, value-add their produce, and compete in national and global markets. Many of these smallholder communities have been devastated by HIV/AIDS. In some regions of sub-Saharan Africa, food production has dropped by 40%, and it is estimated that over the next 20 years, 26% of the agricultural labour force will be lost to this pandemic. And demographic and economic changes in the low-income nations are increasingly leaving farming in the hands of women, who lack the knowledge and resources to farm efficiently.

The Food and Agricultural Organization of the United Nations (FAO, 2000) stresses the importance of information and knowledge in achieving a food-secure world for present and future generations. There is a massive need for agricultural extension to maintain the natural resource base, for example, to help smallholders increase cropping intensities, diversify into higher-value commodities, and adopt new methods of natural resource management and integrated pest management (Swanson, Bentz, & Sofranko, 2003).

In its traditional forms, agricultural extension has aimed at transferring research findings to farmers through face-to-face training and farm visits. It has been top-down, limited in scope, and slow to change ideas and practices. The more recent approaches to extension are farmer-demand-driven (Lightfoot, 2001). They empower the smallholders to form themselves into learning communities, identify needs, trial proposed methods, and adopt, modify, or discard practices according to their findings. They do not depend solely upon information, ideas, and practices provided by agricultural researchers and extension workers. The farming communities are encouraged to share their knowledge and experience.

The major challenge lies in finding how to fast-track such extension programmes more widely and equitably. Because of their locations or other personal circumstances, many smallholders cannot currently access extension programmes. To make matters worse, many extension services are now being downsized, decentralized, privatized, or only made available on a fee-for-service basis, which puts them even further out of reach of the smallholders. There is, therefore, enormous need and potential for ICT and distance learning to be applied to expanding and strengthening agricultural extension in low-income countries.

TECHNOLOGIES AND METHODOLOGIES

ICT and distance learning allow training and information to be delivered far beyond the traditional catchments of the providers. They allow for interaction, negotiation and exchange as well as the transmission of content. By allowing rural communities to be contributors and communicators and not merely passive consumers, they have the power to really help to change hearts and minds (Richardson & Paisley, 1999; Mundy & Sultan, 2001).

A number of agricultural research and extension agencies are now adopting these newer approaches. Some focus on using technology to overcome the physical and communications barriers between researchers and extension workers, while others are concerned with developing the tools to provide the smallholders with access to databases, decision support tools, online discussion groups, advice, news items, etc.

It should not be assumed that computer, Internet, and satellite technologies invariably provide all the answers for this work. Connectivity, cost, and a lack of technical know-how and support are still major constraints within

ICT and Distance Learning for Agricultural Extension in Low Income Countries

Table 1. Technologies, applications, and their strengths and weaknesses in extension

Technology or application	Strengths	Barriers to utilization	Examples
Printed materials	Can play an important role in extension. Compact, well-suited to self-paced learning and often the most cost-effective medium.	Require literacy in the smallholders. May be slow, difficult and costly to deliver into remote communities. Lacking moving images, may not be able to demonstrate some processes. Can be slow and costly to customize to local needs and languages.	Booklets, posters, pamphlets and handouts are used in many extension programs, sometimes in conjunction with other media.
Radio	Commonly available, relatively low-cost technology with extensive reach in low income nations. The costs of a community radio station need not be high – Radio Apac (http://radioapac.tripod.com/liraext.html), a Commonwealth of Learning Media Empowerment (COLME) initiative in Uganda (http://www.col.org/colme/about%20COLME.htm), broadcasts from a radio station that fits into a suitcase, hooks up to commercial FM networks and satellite feeds, has a 50km radius, runs on car battery or solar power, and costs about US$3,500. Similar systems are used elsewhere in Africa and in Canada, Jamaica and South America.	The privatization of some state radio stations has led to commercial prices being charged for timeslots which may be beyond the means of the extension providers. Power supply and even battery costs may be problems for some farming communities. Radio reception may be problematic in some mountainous regions.	Agricultural radio programmes are used to support extension in, e.g., Nigeria, Uganda, Fiji, and Trinidad and Tobago. Other examples include Simli (Friendship) Radio in northern Ghana (http:www.odi.org.uk/agren/papers/agrenpaper_127.pdf), and the Tamil Nadu Agricultural University's extension programme (http://www.tnau.ac.in/aabout.html) that use a mix of radio broadcasting, audiocassettes, print, Correspondence, and one-day contact programmes
Farm Forums	'Phone-in' and 'listen-discuss-act' radio programmes enable small-holders to form themselves into self-help groups and work with the broadcasters and extension workers in identifying issues, collecting data, defining and analyzing problems, and discovering workable solutions.	Production costs can be high. A number of Farm Forums have ceased as a consequence of the privatization of state radio and sub-sequent increase in costs of air time.	The Papua New Guinea Educational Development Centre (EDC) Multichannel Learning Centres combine interactive radio broadcasts in pidgin with audience participation by local clans with the aim of finding ways of managing and conserving rainforest under threat from loggers and land developers (http://www.main.edc.org/mosaic/Mosaic2/building.asp). Farm Forums have also been used in Africa, India and elsewhere.
Radio and the Internet	Combines the motivational and 'reach' advantages of radio with the 'search' and 'interaction' capacities of the computer and the Internet.	Lack of infrastructure, technology, technical support and computer skills. Production costs.	In the Kothmale Community Radio Internet Project (http://www.kothmale.net) in Sri Lanka, daily programmes are broadcast in which presenters browse the Internet live in response to listeners' requests, explain the information accessed, and enable local communities to develop Websites that are then hosted on the station's server.
Television	Highly motivational. Provides sound and moving pictures to demonstrate processes. Effective in low literacy communities.	High costs of production. Limited penetration in some regions.	India's cable ETV has a programme, Annadatta, in which trained agricultural journalists use video to develop programmes for local farmers in Andhra Pradesh. Gujarat Agricultural University and Andhra Pradesh University in India have experimented with narrowcast television (http://www.cta.int/observatory2003/case_studies_Case_study_India.pdf).
Audiocassettes and videocassettes	May be sent to communities unable to receive radio or television broadcasts. May also be used to exchange information and practices between communities and other groups.	Dispatch may be slow and cumber-some.	Used in a number of extension programmes programmes as an alternative or a supplement to broadcasts.

Table 1. (continued)

Technology or application	Strengths	Barriers to utilization	Examples
Telephony	Telephony, especially cellular telephony, has a great potential in extension. SMS and WAP-enabled cell phones enable the sharing of ideas and experiences between shareholders, researchers and extension workers.	Many governments lack the means or the political will to improve poor and costly telecommunications. Without telephony infrastructure, not much is possible in the way of Internet-based knowledge sharing, information services, etc. Connectivity costs may be excessive. However, technical advances such as making and receiving calls via the Internet can reduce the costs of long-distance and international calls.	Grameen Telecom's Village Phone Programme in Bangladesh (http://www.grameen-info.org) is made possible by the small loans from the service in rural and remote areas. Grameen Bank to local entrepreneurs who are too poor to qualify for normal loan schemes. These allow village women to set up and earn income from telephone points that enable local farming communities to access vital market and business information, generate income, and establish local micro-enterprises. Manobi (http:www.manobi.net), in Senegal, is a WAP provider that informs and links farmers in remote and undeveloped areas. By making it impossible for wholesalers to inflate prices, by shortening negotiation times, and by decreasing the wastage of perishable goods, etc., this system enables farmers to increase their revenue by twenty percent after deducting the costs of communications.
Audioconferencing	Helps experts and communities build relationships and understandings. Audioconferencing via computers and the Internet also enables smallholders to simultaneously share visuals, access Websites, and exchange text messages. Well suited to smallholding communities with low literacy levels.	Communications are synchronous, so where personal telephones are unavailable, smallholders must attend centres at set times which may be inconvenient for them.	n/a
Videoconferencing	Allows researchers, extension workers and community groups to see as well as hear each other and exchange digital photographs and video clips. .	Capital and recurrent costs are high but reducing with desktop/Internet-based systems. Communications are synchronous, so the timings and locations of the conferences may be inconvenient for farmers.	The National Institute of Agricultural Extension Management (MANAGE) (http:www.manage.gov.in in India provides and meets the costs of videoconferenced meetings between research and extension staff and training and information services.
Video and digital cameras	Enable digital photographs and video clips of crops, livestock, diseases, pests, etc., to be shared by surface mail or email.	Cost and lack of technical expertise.	The Commonwealth of Learning COLME project (http://www.col.org/ colme/about%20COLME.htm) trains extension workers to shoot and edit digital video agricultural and agribusiness programmes in Africa and the Caribbean. This enables local content to be gathered and broadcast or distributed on cassettes in visual forms that are much appreciated by the farmers, and extension workers to disseminate new ideas and practices throughout many more communities.
World Wide Web	Provides access to current local and global knowledge and information in the form of text, graphics, photographs, streaming audio and video. Allows data to be exchanged between researchers, extension staff and farming communities in seconds rather than days or even weeks.	Cost, lack of infrastructure, access, technical support and computing skills. Smallholders not being capable of managing their own learning and discriminating between reliable and and dubious sources. Developers not being capable of using the advanced authoring tools or customizing material to individual needs while achieving economies of scale by providing for large and even global audiences.	The Rice Knowledge Bank (http://www.knowledge bank.irri.org). The World Agroforestry Centre (http://www.worldagroforestrycentre.org),. The Virtual Academy of the Semi-Arid Tropics (http://www.vusat.org). The Commonwealth of Learning, FAO and CGIAR Knowledge Finder (http://colfinder.org) Access to Global Online Research in Agriculture (AGORA) (http://www.agineretwork.org/en) The Virtual Extension and Research Communication Network (VERCON) (http://www.fao.org/sd/SDR/SDRE/Vercon.ING.pdf)
Email and Computer-conferencing	Delivery is fast and with the right infrastructure, inexpensive. The technology is relatively easy to master. Exchanges are asynchronous and fairly quickly initiated.	Lack of infrastructure, access, technical support and computer skills. Costs – which increase both for the providers and the end-users as the extent, frequency and number of interactions increase.	The Development of Sustainable Agriculture in the Pacific (DSAP) project finds the low levels of connectivity between the Pacific island states mean that ICT-based communication is currently limited to email.

Table 1. (continued)

Technology or application	Strengths	Barriers to utilization	Examples
Satellite radio and the Internet	Can help regions with low teledensity access multimedia content, large-volume data, and global knowledge resources.	Lack of infrastructure, access, technical support, funding and computer skills.	The Arid Lands Information Network-East project (http://www.alin.or.ke/activities/initiative.htm) is a network of community development and extension workers involved in dryland development. It uses WorldSpace Foundation (http://www.worldspace.org) digital satellite broadcasting technology to provide Web-based text, sound and images to rural communities lacking telephone access in Africa, Asia and Latin America.
CDRoms and DVDs	Easy to store text, audio, graphics and video in documents to support learning. Inexpensive to mail to smallholders without Internet access.	Lack of infrastructure, access, technical support, and computer skills. Cost. Smallholders not being able to manage their own learning.	The Inter-American Institute for Cooperation Caribbean Agro-Entrepreneurs Distance Learning Centre (http://www.agroinfo.org/caribbean/iicacarc/jamaica/adltcnew.htm), in partnership with Canadian universities, Caribbean Export, and Seven.com, Barbados, uses the Internet and CDRoms to deliver extension throughout the region.
Mobile computing	Study laptops and notebooks can be used anywhere in the field.	Cost. Lack of technology, computer. skills and technical support.	FAO-trained Thai extension workers use hand-held computers containing farm decision support programmes to guide farmers in using fertilizers, optimum planting dates, anticipated yields, etc. Fintrac Agribusiness Support in Honduras uses GPS portable weather stations, digital cameras, laptops, portable printers and cell phones to enable extension workers to spend ninety-five percent of their time in the field, immediately access vital information and make on-the-spot recommendations to farmers. Future Fintrac laptops will have fully replicated versions of the master database for locations without Internet access (www.fintrac.com/default.htm)
Telecentres, information kiosks, ICT-equipped vans, etc.	Help to bridge the digital divide by providing communities with ICT training, facilities, and services.	Poorly thought-through business plans. Poor management and service delivery. Lack of community support and necessary critical mass of users.	Gyandoot rural cybercafés (http://www.gyandoot.net) and the MANAGE information kiosks (http://www.manage.gov.in) in India, the IDRC/Acacia telecentres in Africa (http://www.bellanet.org/partners/aisi), and the Caribbean Agricultural Service RUNetwork Information Cafés in Jamaica (http://www.caisnet.org/jamaica_pilot_project.htm).

many farming communities. This is why the CTA (2001, 2003) concluded that what is needed is a mix of new and conventional technologies adapted to the specific needs, skills, and resources of the local communities.

Table 1 summarizes the nature, strengths, and weaknesses of the various technologies and applications that can be used in extension, and gives examples of their use.

FUTURE TRENDS

Combining the technologies and methodologies described above with demand-driven, participative, community-focused distance learning offers an exciting new paradigm for agricultural extension. Networks, programmes, and services can be developed to provide farmers with just-in-time education, information, and advice from multiple sources, regardless of where the providers or end users are located.

The overriding challenge is to achieve strong commitment and partnership by governments and public and private donors and service providers and ensure that their actions match the rate of technological change. If this can be achieved, there never need be any lack of access to training in farming and agribusiness, or too many communities to serve.

CONCLUSION

The CTA (2003) concludes that to date, despite all the rhetoric, there have been few revelatory, paradigm-shifting approaches to extension. International and national agencies are beginning to explore the possibilities of

extension through ICT and distance learning, but these initiatives rarely receive high priority, and few of the providers have the funds, infrastructure, knowledge, or capacity to tackle this task on the scale required. Most of the initiatives have been short-term pilot or donor-supported provider-driven information programmes rather than demand-driven distance-learning programmes. Some have been successful and are replicable. Others have not been sustainable or, for whatever reason, have not been mainstreamed or institutionalized. Unfortunately too, there has been little evaluation of the take-up, usage, applicability, outcomes, and cost benefits of these initiatives.

There is a need to move beyond this piecemeal approach. The Neuchâtel Group (1999) urges international development agencies, governments, nongovernmental organizations (NGOs), private and public service providers, agricultural and educational organizations, and the private sector to form partnerships and networks to advance agricultural extension in low-income countries. All of those agencies involved in this major and challenging task need to be willing and able to change their roles and mandates and develop new competencies (Lightfoot, 2001). Experts in agriculture need to adopt learner-centred approaches. Experts in ICT need to understand the particular requirements of extension. Rural organizations need to help find ICT-based solutions (CTA, 2003). Regional and local service providers need to help in translating programmes, materials, and support services into local languages, cultures, and agro-ecological zones. And, systems are needed to ensure that the education and information provided is timely, user-friendly, relevant, and available at the click of a button to farming communities, local radio stations, newspapers, NGOs, etc.

Some of these services will need government or donor funding. Others may have to be paid for by the communities themselves. The circumstances will determine the means (van der Stichele & Bie, 1997).

Like the CTA, the FAO (1997) cautions against depending upon the Internet as the panacea for development. The CTA (2003) stresses that the technical tools and solutions must be country- and location-specific, and Maru (2003) observes that technology-based approaches can only succeed where there is appropriate and localizable content and interaction and indigenous capacity to generate them.

Perraton (2000) observes that distance learning has met with failure as well as success in the developing world, and McLean et al. (2002) stress that no single model of distance learning is appropriate for all target groups. A distance-learning provision must therefore be carefully adapted to the social, cultural, economic, and political circumstances of the communities and their environments. Far more is needed than merely placing lecture notes, handouts, research findings, or PowerPoint pre-

sentations in English and using technical jargon on the Web or CD-ROM. The programmes need instructional design. They need to be:

- Developed in conjunction with, and disseminated to, multiple stakeholders (farming communities, extension workers, rural businesses, NGOs, schools, etc.)
- Interactive, multimodal, and multimedia
- Collaborative, with extension workers or local facilitators helping the smallholders to become motivated, master the technology and new learning, and apply and test the new or improved methods in the field
- Up-to-date, authoritative, and appropriate to the circumstances, expectations, culture, language, prior learning, literacy, and comprehension levels of the smallholders
- Designed for self-paced individual and group learning
- Dialogic, offering the smallholders opportunities to collaborate and share ideas and experiences with others who understand their circumstances and whose views they respect
- Simple to understand, easy to work through, and practically oriented
- Based upon both local indigenous and global knowledge and practice
- Appropriate to the technology, budgets, and time available to the providers and users
- Faster, cheaper, better, and more equitable than any of the alternatives

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KEY TERMS

Global Positioning System (GPS): Worldwide radio-navigation system formed from a constellation of 24 satellites and their ground stations that provide reference points to calculate positions accurate to a matter of metres, and with advanced forms, to less than a centimeter. GPS receivers are so miniaturized that they are becoming accessible to virtually everyone. Used in cars, boats, aircraft, construction equipment, farm machinery, and even laptop computers, they are predicted to become almost as basic as the telephone.

SMS (Short Message Service): Facility that allows short text messages to be sent to GSM (Global Systems for Mobile Communications) mobile phones.

Wireless Application Protocol (WAP): Advanced intelligent messaging service for digital mobile phones and other mobile terminals that allows Internet content to be viewed in text format on special WAP-enabled GSM mobile phones.

ICT and Regional Development in Australia

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INTRODUCTION

Hervey Bay

Hervey Bay is located in the Wide Bay Burnett region of Queensland, Australia. Based on a number of economic and social indicators, the region can be described as disadvantaged (Planning Information Forecasting Unit, 2001). The median weekly income of the region is well below the Queensland state average. The overall unemployment rate for the region is around 16% with about 23% for youth unemployment. The population is aged with 20.7% of the population aged over 65 compared with the Queensland average of 12.4% (Paussa, 2003). Within the region the ratio of welfare payments to personal disposable income is 27.9% (Bray & Mudd, 1998), which is the second highest welfare recipient rate for a region in Australia.

These demographic characteristics are important in understanding the region. Information from the Australian Bureau of Statistics (2001) indicates the overall level of digital inclusion is increasing, albeit at a decreasing rate, with an increase in the number of households with Internet access. However, this inclusion is not uniform across society. Generally, in Australia access to the Internet and a personal computer is positively correlated to income, employment and location in urban areas. Age tends to have an inverse relationship to ownership of a personal computer.

Comparison of the estimated number of Internet subscribers across statistical division populations for Queensland shows a disparity for the Wide Bay Burnett statistical division within which Hervey Bay is situated. This division has 3.2% of Internet subscribers within Queensland (Australian Bureau of Statistics, 2002) and approximately 6.6% of the estimated state population. While it is true that all rural regions in Queensland, apart from Fitzroy (based on the City of Rockhampton), exhibit somewhat similar patterns, Wide Bay Burnett is particularly undersubscribed on a per head basis with respect to the Internet (Pease, Wright & Cooper, 2003). This is an issue of particular concern for the Wide Bay Region since it illustrates a paucity of rich information and a lack of "connectedness" with the outside world. These statistics point to the potential barriers that may inhibit the uptake of the Internet by individuals and small business within regional Australia.

Despite this, the profile of the region is changing as the city and region grows at a rapid rate, bringing with it, rapid in-migration and investment. In a recent report the region was identified as ranking amongst the top 35 cities within Australia, experiencing one of the fastest growth rates in the country at around 8.5% per annum (KPMG Business Advisory, 2003).

Infrastructure

Australia is amongst the leaders in the provision of infrastructure facilitating the uptake of e-commerce and the Internet. The National Office for the Information Economy (NOIE) ranked Australia 3rd overall behind the United States of America and Sweden in a benchmarking index which ranked 14 key countries across 23 statistical indicators relating to progress in developing the information economy (National Office for the Information Economy [NOIE], 2002).

In this study the United States of America, Scandinavia, Australia, New Zealand and the smaller countries of South East and East Asia are considered to be in a strong position to take advantage of the potential benefits of the emerging global information economy, having the beginnings of the necessary infrastructure and a critical mass of people actively online. It was noted, that for the majority of countries benchmarked, there is still significant room for improvement, with large sections of their respective populations remaining outside the information economy either having access to the Internet and not using this resource, or not having the opportunity to use the Internet due to a lack of access opportunities (NOIE, 2002).

The data presented in the NOIE report shows that Australians tended to be "early adopters" of information economy enabling technologies such as the Internet, computers, and mobile telephones, and increasingly use the Internet for a wide range of activities associated with their day-to-day lives. Australians have been quick to adopt earlier generations of communications technology such as faxes and analogue mobile phones. Like most developed nations, Australia was slow to start with broadband digital services, but is now beginning to climb the broadband adoption curve for second generation services.

In December 2001, Australia was ranked 18th in broadband penetration out of 30 OECD countries (Organisation for Economic Co-operation and Development, 2002). Growth in the uptake of broadband technologies in Australia has continued at a significant rate with the majority of the increase being attributed to the availability of Digital Subscriber Line (DSL) and Asymmetric Digital Subscriber Line (ADSL) and a growing consumer awareness of broadband services (Australian Competition and Consumer Commission, 2002; NOIE, 2003). Australia's CDMA network is the second largest in the world after that of China (P. Symington, personal interview, May 15, 2003). Still the digital divide in Australia is very real and is manifest in generally differing Internet behaviours in urban and regional areas.

The rate of adoption in Australia of information economy enabling technologies has slowed down relative to other countries which have encouraged the innovative use of ICT technologies. In a report published by The Economist Intelligence Unit (*The 2004 e-Readiness Ranking*, 2004) in conjunction with IBM, early leaders like the USA and Australia have experienced a stagnation of e-commerce growth. The report ranks the world's 60 largest economies and measures a collection of factors which quantify a country's "e-readiness," i.e., a measure of its e-business environment. Australia's position in terms of e-commerce readiness has declined from 3rd in the world in 2001 to 9th in 2003 and 11th in 2004. With national governments driving the development, countries such as Singapore, Norway and Denmark have eagerly adopted the Internet. The relative position of a country in terms of e-commerce uptake and e-readiness is important in that it indicates its ability to take advantage of the potential benefits of the emerging global information economy.

The Australian Commonwealth Government has implemented a number of strategic initiatives designed to provide a suitable national environment for the development and use of ICT by business (NOIE, 2003). These initiatives include the:

- National Communications Fund ($50m) which targets the education and health sectors by providing funding for broadband infrastructure and applications,
- Advanced Networks Fund ($36 million) to support research and development of advanced network technologies, and
- Networking the Nation ($464 million) to bridge the gap between urban and regional Australia.

In light of the rise of e-commerce in countries such as Denmark and Singapore, it would appear that an integrated and innovative government strategy to encourage the same growth is needed in Australia.

Telstra, via its business unit Telstra Country Wide, has embarked upon a program of infrastructure improvement in regional Australia, including the Hervey Bay/Maryborough region. In the financial year 2002/3, Telstra Country Wide injected $187m into improving access to the telecommunication network in regional Australia, $4 million of which was earmarked for the Wide Bay/Gladstone region within which Hervey Bay is situated (P. Symington, personal interview, May 15, 2003).

From the above it would seem the provision of general infrastructure is not, on the face of it, a major impediment to the uptake of the Internet for individuals or e-commerce amongst business, at least within the Hervey Bay region. The issue of equity and access evident in Hervey Bay seems to arise from a cost perspective. The affordability of personal computers and connection to appropriate infrastructure is prohibitive for some, given their socio-economic position.

This issue of affordability in regional Australia was identified by the Eastens Regional Telecommunication Inquiry (Department of Communications, Information Technology and the Arts, 2002, p. 228) as a major concern and recommended that:

The Government should establish an incentive scheme for the provision of higher bandwidth services to regional, rural and remote areas, to enable all Australians to have access to services at prices comparable to those prevailing in metropolitan areas.

The inquiry considered that access to higher bandwidth services was "vital for the economic and social development of regional, rural and remote Australia" (Department of Communications, Information Technology and the Arts, 2002, p. 205).

A number of initiatives have been adopted in the Hervey Bay region to address the impediment of accessibility by increasing access to Internet-ready computers as well as encouraging the discussion of issues and the provision of assistance regarding access and e-commerce problems individuals and small business proprietors might have. One such initiative is Bay Connect.

Bay Connect

Bay Connect was established in 1998 following work carried out by the Hervey Bay City Council and the community which identified the need to overcome the existence of an "information poor" (Langtry, 1998) sector in the community through the facilitation of access to the Internet. A grant was won under the auspices of the Networking the Nation scheme to realise the four-year project. Additional funding was also provided by the local council and a community body, Community Solutions Hervey Bay Association Inc., set up in Bay Connect's planning stages to address social fragmentation and isolation issues that existed in the area.

Networking the Nation was established during a time of political disenchantment and regional economic decline with the hope that new forms of ICT would assist in developing community capacity within rural communities. Community capacity can be used by its members to improve their material well-being, for example, by providing important social services (Pigg, 2001).

Bay Connect was initially set up as a service allowing free public access. The project provided free training, free access to e-mail and Internet access to holders of health care and pensioner concession cards (Wright, 2001). In 2000, a user pays system was introduced. The model adopted by Bay Connect offers support to the community to encourage access to, and use of, ICT and the Internet.

The concept of Bay Connect has flourished to such an extent that assistance has been given to other local government councils (Maryborough, Tiaro, Gympie and Bundaberg) in the Wide Bay Burnett region to make successful funding applications to implement a similar model within their respective regions. In the final round of Networking the Nation in 2002, additional funding was granted to Bay Connect to establish an adaptive training room to further increase access to the Internet within the community. The training project that Bay Connect offers still continues to support a range of clients from the community. It is estimated that over 1,838 people have passed through the training program since its inception in 1998 (McKeehan, personal interview, May 29, 2003).

The Role of Education

The observed slowness of uptake of e-commerce in regional and rural areas of Australia, and the Wide Bay region specifically, may relate to a lack of information on the part of individual small and medium enterprises (SMEs) that would enable them to make well informed planning decisions. Parker and Swatman (1996) in investigating the slow uptake of electronic data interchange (EDI), noted that education was a major causative factor of the slow uptake rate of EDI and found that more specifically tailored training courses involving simulation were necessary and more effective than general seminar-based approaches, which tended not to apply to a particular business or demonstrate how the technology would assist in solving the problems of business.

This is in keeping with the Small Enterprise Telecommunications Centre (SETEL) findings which indicated that, for Australian SMEs at least, there was a lack of realisation of the value and benefits of e-commerce. SETEL contends that the focus needs to be based on four elements: simplification, demystification, leadership (by Government, industry, educators) and promotion of the value proposition to SMEs. In communicating the virtues of e-commerce, the focus needs to be placed on benefits to the business rather than benefits of technology per se (Brown, 2002, p.18).

The role of education institutions in the communication of these benefits is an interesting one and further research into their role in promoting and encouraging the uptake of e-commerce, as well as appropriate means by which to educate users and potential users, needs to be carried out.

IMPLICATIONS FOR THE HERVEY BAY REGION

Small and Medium Enterprises (SMEs)

There are a number of SMEs who are embracing e-commerce in their businesses in the Wide Bay region. However, a number of these businesses are not fully utilising the functionalities that e-commerce offers (Pease & Rowe, 2003, 2004). Reasons cited in discussions with proprietors would indicate this was due to lack of awareness and knowledge, lack of know-how, scepticism about security and a fear of the "unknown" or a fear of technology itself.

A lack of planning or even acknowledgement that potentially e-commerce might assist in the operation of their business is an overarching obstacle.

The Community

A community can be described as a group of people with a shared interest, purpose or goal who get to know each other better over time (Kim, 2000). The Web facilitates the building of a community and essentially may act as a community itself as it provides a gathering place. Bay Connect has been a vehicle which has helped to build the community in simple ways.

Research was undertaken in 2001 (Wright) to investigate Bay Connect's client use of the Internet. Amongst

other things, the research showed that new users as a result of the Bay Connect project experienced a change in their media use patterns. Exposure to the Internet has had some impact on the way they sought out information and the means by which they communicated.

The Bay Connect experience has increased awareness and utilisation of this form of communication amongst its members. Bay Connect clients had a greater propensity to purchase computers and used the Internet independently of the Bay Connect service. Over 90% of respondents indicated that they would access and use the Internet if it was available to them.

Bay Connect is a key component in community capacity building through the integration of ICT opportunities with other forms of community development. Individuals, and groups, have been able to support each other or to access greater levels of information thereby increasing their social capital through stronger networks, offering more opportunities for economic and social participation.

CONCLUSION

Internet-mediated communication is becoming important as a major means of communication within Australian society. Despite this, there are many issues of equity that need to be considered, notwithstanding the efforts of bodies such as Telstra Country Wide to install infrastructure which in part addresses the information divide between urban and regional communities.

The challenge for Australian communities, particularly those in regional areas, is to increase access and promote awareness of the Internet as a means of communicating, and to provide cost effective and non-threatening training in the use of these technologies.

Longitudinal studies of the ongoing effectiveness and role of the Bay Connect model and its rollout throughout other regions needs to be carried out, especially as the Networking the Nation project funding draws to its end. Evolution of the model must occur, especially if it is in the future to become more self-sufficient.

The objective of Bay Connect is to overcome the barriers that potentially limit the positive and democratising benefits the Internet affords to the community. The achievement of this objective can only be observed over time.

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KEY TERMS

Bandwidth: Bandwidth measures the amount of data that can be transferred in a fixed amount of time using a specified communications channel/pathway in a computer network. The term is often used as a synonym for data transfer rate.

Broadband Digital Services: These allow very high data transmission rates and are the most popular and widely used kinds of digital services. These services include DSL, ADSL and cable modem services**.**

CDMA (Code Division Multiple Access): One of several protocols used in 2G (second generation) and 3G (third generation) wireless communications. It allows numerous signals to occupy a single transmission channel optimising the use of available bandwidth.

Community-Based Information Technology: The provision of training and information technology services to local communities to meet their communications needs.

Community Capacity Building: Investment in people, institutions and practices that will, together, enable communities to achieve their goals.

Community Informatics: The use of ICT and associated facilities in conjunction with the development and delivery of programmes to aid community development - economically, culturally and socially.

Digital Divide: The gap that is said to exist between people and communities who can access and make effective use of information and communication tools, such as the Internet, telephone, and computers, and those who cannot. This division not only occurs between rich and poor, but across many other population segments, for example, urban versus rural.

DSL (Digital Subscriber Line) and ADSL (Asymmetric Digital Subscriber Line): Technologies that provide high bandwidth digital data flows over existing ordinary copper telephone lines to homes and small businesses.

Knowledge-Based Future: Essentially this reflects the new economy whereby knowledge sharing and knowledge management are critical to organisations success and the achievement of a sustainable competitive advantage. Knowledge sharing is also important for the community as a whole.

New Economy: This describes aspects or sectors of an economy that are producing, or using, innovative or new technologies. It therefore also captures the impact of these changes. The Internet and associated technologies typifies the essence of the new economy.

ICT and the Efficient Markets Hypothesis

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INTRODUCTION

This article represents a preliminary attempt to indentify the variables influencing the relationship between technological development and efficiency in the financial markets of a Caribbean economy. The analysis uses qualitative methods only. From the late 1980s, Kitchen (1988) observed, "… the major inefficiency in the capital market is the lack of information…" (p. 48). Two characteristics that differentiate the financial markets of developing countries from those of developed economies, and have an impact on their efficiency are:

1. A small number of investors;
2. Few types of investors;
3. The limited range of financial instruments.

The above render the financial markets inefficient, from the perspective of the Efficient Markets Hypothesis, compared with those of developing countries. As the ICT infrastructure among developing countries varies, the article is limited to one country—Jamaica. The Jamaican financial market was considered a top performer among emerging markets in 1992, based on movements in its stock prices. Following the collapse of the island's financial sector in 1993, the market remained in the doldrums for several years..

The government and the key players in the financial services sector recognized the need to upgrade the technological infrastructure of the financial markets to attract international players and render its operations more efficient and transparent. The technology permits trading in real time, across borders among the three major exchanges in the Caribbean-Trinidad, Jamaica and Barbados.

In the last 12-15 years, in addition to attracting international institutional investors, the Jamaican financial services industry has been actively educating the local individual investor to attract his participation in the financial markets as an individual investor – whether as a holder of a Unit Trust/Mutual Fund, Treasury Bills, Local Registered Stock or as a minority stockholder in a listed company. The Jamaican market, therefore, provides an example of an institution that recognized the importance of the role of ICT (especially Internet-based technologies) in its re-emergence from relative obscurity and as it attempts to facilitate economic development.

The outline of the article is as follows:

1. The role of the financial sector in the development process in an economy and in wealth-creation.
2. The structure of the Jamaican financial market.
3. The underlying theoretical framework—the efficient markets hypothesis and the contribution of 21st century technology to the improved efficiency in the Jamaican financial markets. It assesses measures of the technological development of the country-teledensity and infrastructure development and legal considerations. These are considered important issues for local development as, in addition to international institutional investors, the key players have been actively trying, in recent years, to attract the participation of local individual investors into the market to facilitate a more diverse basis of local wealth creation. In addition, international investors can serve as an invaluable source of capital during a public offer of shares.
4. Issues in customer relationship (client account management) and operations management (back office operations) in the financial services sector that have been, or can be addressed by enhanced technology. These are the key areas of management of financial services that impact directly on market efficiency.
5. Opportunities for new technology product development, training and marketing that may reasonably be considered by software developers, infrastructure providers, and providers of technology training services, with the intention of attracting skilled persons into the field of technology and/or improving the technological infrastructure and applied knowledge of the key players in the financial markets.

BACKGROUND

Martin Sewell, owner of the Web site, http://www.e-mh.org, states that "…The origins of the Efficient Markets Hypothesis (EMH) can be traced back at least as far as the pioneering theoretical contribution of Bachelier (1900) and the empirical research of Cowles (1933). The modern literature in economics begins with Samuelson

(1965), whose contribution is neatly summarized by the title of his article: 'Proof that Properly Anticipated Prices Fluctuate Randomly'… ." Solnik and McLeavy (2004) argue that "the notion of an efficient market is central to finance theory. In an *efficient market, any new information would be immediately and fully reflected in prices.* Because all current information is already impounded in the asset price, only news—that is, unanticipated information—could cause a change in price in the future" (p. 24).

The central concept of this article is that technology facilitates efficient financial markets by making information available to existing and prospective investors on a timely basis. It assumes greater relevance in light of the global nature of financial transactions. An efficient financial market is required to attract global institutional investors to an emerging economy. In addition, it facilitates the wealth creation process among the local populace. The author is unaware of any recent scholarly work that considers the Jamaican financial markets, from the perspective of the Efficient Markets Hypothesis. In the last five years, several governments and international bodies have sponsored conferences and working groups to help developing nations consider the impact of technology on key sectors of the economy. It was argued that technological infrastructure and legal and audit concerns ranked highest in their priorities to develop the national economies. Bridges.org (2001), Digital Opportunity Initiative (2001), Grant (2001), COMNET-IT (2002) and UNCTAD Secretariat (2002) offer similar opinions.

Grant (2001) refers to the work of the E-Commerce working group, a sub-committee of the E-Commerce Committee of Jamaica that identified a number of requirements for the successful implementation of e-commerce in the island. He cites the following:

i. **Human resources skills:**
   - "Education across all parts of the society in ICT is needed. This is in fact a cross-cutting issue and should be given the highest priority and resources allocated. Some important areas of development for the private and public sector are:
   - The establishment of Life Long Learning facilities to facilitate technology training by older users who may be intimidated by technology.
   - To inculcate a vision of ICT usefulness through training of senior management in IT skills rather than creating an environment where they are forced to use technology" (p. 24).

ii. **Improved ICT infrastructure:**
   - "Electricity-should be available to all persons in reliable supply.

- Telecommunications to every home and business place and at low cost (VSAT, Fibre, Wireless, dial-up).
- Database Security, Dependable backup, redundancy, disaster mitigation, and when all else fails, adequate consequential loss insurance" (p. 24).

The financial sector was not mentioned in this discussion, possibly because the financial markets were well underway, with the process of upgrading their technological base. In Jamaica, the thrust toward improved technological infrastructure was largely driven by the private sector (viz. the Stock Exchange, stockbrokers and investment bankers), which felt the need to meet international standards to attract the international investment community. The Caribbean and international academic communities appear not to have carried out significant research on this topic. Hopefully, this article will stimulate further discussion and writings on this issue within the development, academic and professional communities.

FINANCIAL MARKETS AND ECONOMIC DEVELOPMENT: THE EFFICIENT MARKETS HYPOTHESIS

The Efficient Markets Hypothesis

Reilly and Brown (2000) state that the most basic form of the efficient markets hypothesis—the weak form—"…assumes that current stock prices reflect all *security-market information*, including the historical sequence of prices, rates of return, trading volume data, and other market-generated information such as odd-lot transactions, block trades, and transactions by exchange specialists or other unique groups" (p. 215). An efficient market, therefore, has few opportunities for arbitrage, as imbalances are immediately corrected by the immediate dissemination of information using ICT.

The Role of Financial Markets in the Development Process

Finance is considered the "lubricant" of the wheels of the productive sector. ICT have dramatically transformed the manner in which the financial services sector of developing economies operates. As with other industries, ICT help financial markets become more effective, customer-oriented and transparent in their operations. ICT facilitate the investment decision-making process as follows:

1. The delivery of investment information on a timely basis, using computerized investment information systems and investment research tools.
2. Verification and delivery of client transaction information for prompt settlement of transactions, and authentication, using automated trading, settlement and depositary systems.

Efficiency and transparency are necessary to attract foreign investors to participate in an emerging financial market. They ensure the survival of such markets, as the local investors lack the resources to support the market, especially during times of economic downturn. Sometimes, the size of a public offer may be reduced, because of the limited capacity of the local market. The economy benefits from the positive impact on individual and corporate wealth enhancement.

How the Jamaican Financial Services Sector Works

Generally, the financial services sector facilitates the purchase and sale of securities on the primary (new issues and IPOs) and secondary markets through the process of financial intermediation. Owners of surplus funds offer their savings to businesses with the expectation of an adequate return. Financial institutions play an intermediary role, allocating funds based on the relative rank of projects and companies, according to their expected returns and risk profile of the project and/or company. Figure 1 depicts the flow of funds within a typical developing economy, such as Jamaica.

Table 1 summarizes the typical types of investors and institutions found in Jamaica, a typical economy with a developing financial structure.

Table 1. Structure of the financial services industry in Jamaica (Source: ICT at a Glance-Jamaica, The World Bank October 3, 2003)

Investment Services Providers	Investors
Life Insurance Companies	Pension funds
Stock/Money market brokers	Life and General Insurance companies
Merchant/Investment Banks	Commercial banks (Usually investments are made only on a short-term basis, due to legal restrictions.)
Trust companies and portfolio managers	
	Other institutional investors, and individuals

Table 2. Economic and social metrics—Jamaica and Latin America (Source: ICT at a Glance Jamaica, The World Bank October 3, 2003) (Source: Compiled by the author, November 2003)

	Jamaica 2002	LATAM & Carib. 2002	Avg. lower middle income nations 2002
Adult literacy rate (% ages 15+)	87.6	89.5	86.6
Urban population (% of total population)	57.1	76.2	49.4

In 2002, Jamaica's literacy rates (and hence, potential for human resource development) compare favorably with the rest of Latin America/the Caribbean and other lower middle-income countries. With a larger rural-based population than most Latin American/Caribbean countries, it becomes important to improve the technology infrastructure of Jamaican rural communities.

Figure 1. Flow of funds within a typical developing economy (Compiled from information contained in Santomero & Babbel, 2001)
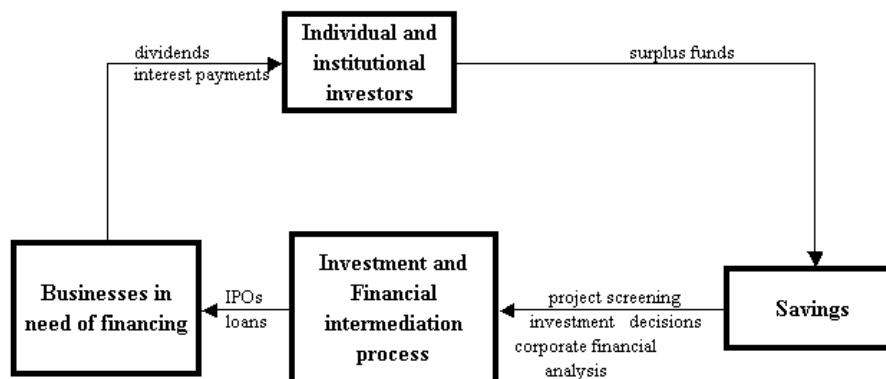
Table 3. ICT metrics for Jamaica compared with LATAM and lower middle-income countries: ICT infrastructure and access   (n.a. Not Available: Sources: ICT at a Glance-Jamaica, The World Bank September 9, 2002 and October 3, 2003)

	Jamaica 2001	LATAM & Carib. 2001	Avg. lower middle income nations 2001
Telephone mainlines/ 1,000 people	197	163	146
Telephone mainlines in largest city/1,000 people	n.a.	175	524
Waiting list (thousands)	209	4,403	27,675
Waiting time (years)	n.a.	n.a.	n.a.
Revenue per line (US$)	949	827	283
Cost local call (US$/3 min)	0.06	0.09	0.04
Mobile phones/1,000 people	269	160	110
Outgoing traffic (min/ subscriber)	144	87	58
Cost of call to U.S. ($/3 min)	5.20	3.20	4.50
Daily newspapers/1,000 people	62	70	n.a.
Radios/1,000 people	796	410	346
Television sets/1,000 people	194	274	292

Table 4. ICT metrics for Jamaica compared with LATAM and lower middle-income countries: Computers and Internet usage (n.a. Not Available¾Sources: ICT at a Glance-Jamaica, The World Bank September 9, 2002 and October 3, 2003)

	Jamaica 2001	LATAM & Carib. 2001	Avg. lower middle income nations 2001
Internet Users ('000)	100.0	25,666.9	68,936.9
Monthly off-peak access charges: service provider charge (US$)	49.3	n.a.	16.7

Table 5. ICT metrics for Jamaica compared with LATAM and lower middle-income countries-ICT business and government environment (n.a. Not Available or Not Applicable [ratings from 1 to 7. 7 is highest/best]: Sources: ICT at a Glance-Jamaica, The World Bank September 9, 2002 and October 3, 2003)

	Jamaica 2002	LATAM & Carib. 2002	Avg. lower middle income nations 2002
Broadband internet access availability	2.5	4.0	3.6
Local specialized IT services availability	4.2	4.5	4.3
Competition in ISPs	4.7	4.0	4.2
Government online services availability	3.3	3.3	3.1
Laws relating to ICT use	3.3	3.3	3.3
Secure servers	5	2,103	2,769

Training and Infrastructure Considerations

Without adequate training and infrastructure, the securities market will not be able to conduct its activities to international standards. Tables 3, 4 and 5 highlight comparative indicators of the level of development of the ICT sector in Jamaica as compared with other Latin American and Caribbean countries and other lower middle-income nations in 2001 and 2002.

In 2002, Jamaica compared favorably with the rest of Latin American/Caribbean and other lower middle income nations with respect to ICT infrastructure and access, computers and Internet usage and the ICT business and regulatory environment. The sole exception was the number of secure servers located in the island, a key requirement for the transmission of confidential information across the Internet. Telecommunications costs remain prohibitively high—the result of the small scale of operations over which the companies recover their overhead costs. At the time of final edit, the author was unable to locate updated information on the metrics for the ICT industry for the year 2003. However, it is unlikely that the island's standing has been lowered as the government and private sector have made significant improvements to the telephony/ICT infrastructure since the start of the 21st century so as to attract international investments and facilitate increased productivity among local businesses.

HOW ICT HELPS IMPROVE MARKET EFFECTIVENESS AND EFFICIENCY

Investment Information

The two critical issues in customer relationship management (CRM) are as follows:

- The availability of accurate information to all existing and prospective investors.
- The timely delivery of information (in or near to real time) to all parties to facilitate prompt decisions.

In 2003, the consulting firm *Caribbean*Portfolio.com (2003) conducted a survey among Jamaican institutional investors. The participants comprised 20 of the largest institutional investors in Jamaica. The findings revealed that investors ranked the timely delivery of transaction information and a prompt response to client inquiries as critical to the success of the investment decision-making process. The Jamaican financial services sector has largely addressed these concerns through the delivery of trading information at the end of the trading day to the major

investors. One firm, JMMB Securities Limited provides text messaging and daily email notification of transactions to its individual investors. Unfortunately, this information is not available in real time.

Operations Management

Operations management is concerned with:

- Trading systems (inter-broker and broker-client systems);
- Settlements (broker-client/broker-broker) Security registration, transfer and custody; and
- Dividend accounting and payments.

The above sub-systems are established using intranet or extranet-based modules. As part of the final phase of its modernization program, the Jamaican financial markets have implemented a Central Security Depository. The Jamaica Central Security Depository (JCSD), "…. a wholly-owned subsidiary of the Jamaica Stock Exchange, is a facility for holding securities which enables share transactions to be processed by book entry. A book entry system is an accounting system that facilitates the change of ownership of securities electronically between parties, without the need for the movement of physical documents. In short, the JCSD is a means of recording the ownership of shares" (JCSD Web site).

Legal Considerations

Grant (2001) argues that any ICT or e-commerce model adopted by the business community will require updated legislature and supporting infrastructure (especially security arrangements) for its successful implementation. Two fundamental changes to the law are proposed:

1. E-Signature or E-Transaction legislation;
2. Laws Protecting Parties, Transactions, Systems and Data.

Such legislation would render signatures as legally binding as those done in print or handwritten form. The supporting infrastructure would protect the privacy of the participants, transaction data, and confidentiality of sensitive information, which are critical requirements for the transmission of financial data in cyberspace.

To date, the major regional stock exchanges have been able to conduct cross-border trading operations with a high degree of success, primarily because transactions have been limited to a small number of players and a single network connecting the three major Caribbean financial markets. Grant (2001) notes the difficulty in implementing

secure databases. The author also found it an extremely laborious and time-consuming process to become a trusted member of an international network to be able to sign documents electronically and transmit email with a verifiable identity, as there was no trusted member of that network residing in the island of Jamaica. Updates to existing intellectual property laws and revisions to existing consumer protection laws are also necessary to support the new business environment.

Audit Considerations

This concerns the nature of transaction documentation and audit confirmation available to the accounting and audit community. The *Caribbean*Portfolio.com (2003) report noted that, "… 65% of interviewees preferred that their transactions be confirmed by letter or contract note. For 30% of respondents, email or online verification of transaction was preferred, primarily because the information was accessible at the client's convenience and be available for immediate delivery to its auditors. Almost 68% of respondents preferred settlement by same day cheque, while just over 30% preferred to settle a transaction by direct transfer of funds transferred to/from a bank account…" (*Caribbean*Portfolio.com, 2003). There was some concern that the securities regulatory bodies and the local accounting fraternity had not yet updated their practices to recognize the validity of online or electronic transactions and documentation. It is hoped that the enactment of relevant legislation will force these entities to update their rules.

FUTURE TRENDS AND OPPORTUNITIES FOR ICT IN THE FINANCIAL SERVICES SECTOR

Hardware

Opportunities exist for hardware manufacturers and distributors in the provision of affordable mobile and wireless/satellite technology solutions, as more than half of the population of Jamaica is based in rural communities. The rural parts of Jamaica consist of rugged mountainous terrain with isolated districts scattered throughout the hilly interior. Satellite and wireless technology are considered more appropriate due to the high cost of installing wired telephone service in a hilly terrain.

There will be a demand for hardware used to provide faster wired Internet access services, as existing users upgrade their Internet access from dial-up services to services offering dedicated access and faster connectivity such as T-1 and ADSL, to access information as soon

as it becomes public. Broadband connectivity must improve to speeds available in the major financial centres. High speed Internet access should be made more affordable and its implementation in a home/small business network rendered user-friendlier.

Software

Much of the software requirements of the financial services industry are available from the major financial centres, and may be customized for use under local legal, tax and accounting practices. Others are proprietary systems developed by local programmers.

Training and Human Resources

There will be an increased demand for affordable training services in basic computer use, as computers will become an important part of daily life. The demand for training in the use of wireless/mobile technology will increase as providers develop solutions to meet the needs of the rural population inhabiting the interior hilly regions of the island. Online training is an excellent means of reaching the rural populace. Institutions and service providers will demand for trained and certified system administrators and technicians to implement and support wireless and mobile systems, and to support a growing user base.

There will be a demand at least initially for trained and certified software engineers and project managers to customize and implement trading and security accounting software, as some security registrars still maintain their databases in manual form.

CONCLUSION

ICT have transformed the manner in which the Jamaican financial markets operate. However there is scope for improvement especially in the delivery of Internet access to a larger number of the rural populace. It may be argued that persons living in isolated rural communities, who have sufficient excess cash, already have access to technology. Those who lack this knowledge and technology are likely to improve their lot if afforded the opportunity to gain access to education to improve their earning power.

Once the requirements in the previous sections are satisfied, in the form of a fully-integrated system, that is available to a majority, if not all of the population, then a necessary condition for the existence of an efficient market would have been satisfied, as information would be available to all parties at the same time, on a timely basis, and subsequent payments would have been accounted for accurately and promptly, with minimum loss of interest on outstanding balances.

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KEY TERMS

Arbitrage: The simultaneous purchase of an undervalued security and sale of an overvalued but equivalent security to obtain a risk less profit on the price differential. Taking advantage of a market efficiency in a risk less manner.

Back Office: Settlement and related processes, including the process of paying for transactions conducted on the financial markets.

Customer Relationship Management: The set of automated processes designed to improve customer service.

Efficient Market: A market in which any relevant information is immediately impounded in asset or security prices.

Financial Intermediary: A bank, securities firm, or other financial institution that collects deposits and makes loans, manages the risk associated with the loan process, and/or facilitates the flow of capital between operating units and the economy.

Financial Structure: The set of institutions and processes that comprise the financial system.

Primary Market: The market for new securities issues. In the primary market, the security is purchased directly from the issuer. Includes IPOs (Initial Public Offerings of shares to the public).

Secondary Market: A market in which an investor purchases a security from another investor rather than the issuer, subsequent to the original issuance in the primary market, also called the aftermarket.

Teledensity: The number of telephones per 100 people in a region.

ICT and the Tourism Information Marketplace in Australia

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INTRODUCTION

In November 2003, the Australian Government released the Tourism White Paper, a medium- to long-term strategy for the Australian tourism industry. The Paper provides for funding to improve the availability of high-quality information for the development of tourism in regional areas of Australia. More than $21 million, a historically large amount, has been identified for "…extending the provision of quality research and statistics" (Prime Minister John Howard, Media Release, November 20, 2003).

A growing body of literature about systems of innovation (SOI) supports the notion that secondary information is a vital input to the evolutionary processes of innovation (see, for example, Edquist & McKelvey, 2000, p. 4). The efficient production and distribution of knowledge, of which information is a precursor, is widely discussed as a prerequisite for innovation in economic systems.

There is a long history of relatively poor access to and application of strategic business intelligence in the Australian tourism industry, particularly by those in regional areas. Examples of coordinated and sustained efforts to engender a research-based ethic among tourism enterprises, organizations, and other institutions have been, at best, sporadic (Hunt & Prosser, 1998).

ICT systems are increasingly seen as primary enablers in the dissemination of information to regional economic systems. Online technologies can reduce dissemination costs for suppliers and consumers of strategic business intelligence. ICT systems assist by encouraging the formation and growth of regional- and sector-based networks and cooperatives, facilitating interactions in the global economy, encouraging wider use and application of information, and bridging the information divide between cities and regional areas.

Several tourism information systems have been developed worldwide to help address technological and capacity issues in the industry. Examples exist in Australia, Spain, Austria, Canada, and New Zealand.

The availability of quality research and data for the tourism industry is one side of the information equation and has been the focus of most discussions on the topic (Scott, 1999). However, supply-side issues are not the sole impediments to more widespread procurement and application of tourism research in Australia.

This paper introduces the concept of the Tourism Information Marketplace (TICM) to demonstrate that the historically poor dissemination and application of strategic tourism information in RTS is, in part, the result of barriers to its efficient procurement on the demand side. Previous analyses of this issue have identified weaknesses that exist in the current delivery systems for regional tourism information. These relate to administration of data collections, the knowledge management capacity of small firms and local tourism associations, quality and availability of data, and the technologies that are used in its distribution. This research augments these findings by identifying the barriers to the efficient exchange and procurement of tourism information commodities.

THE IMPORTANCE OF STRATEGIC INFORMATION COMMODITIES TO REGIONAL TOURISM SYSTEMS

There is voluminous representation in the literature of the growth in the size and importance of the global information, or knowledge-based, economy (see, for example, Levine & Lippman, 1995; Nelson, 2000; Shipario & Varian, 1999). Most acknowledge the emergent role of knowledge as an enabler of wealth creation and economic growth. Indeed, some argue that the modern economy is tending toward the application of knowledge for the sake of knowledge itself (Johnston, 1999).

The concept of Systems of Innovation (SOI) is being increasingly described in the literature. SOI are networks of firms, organizations, and other parties who apply knowledge and innovations through interactive learning processes to generate favourable economic outcomes (for a review, see Edquist & McKelvey, 2000). An SOI may exist at any geographic level and may be sector-specific, as in the case of tourism.

Regional tourism in Australia is also characterised by networks and interactions between tourism product suppliers, public-sector organisations, community organisations, other intermediaries, and the legislative and political regimes that influence the region. The systemic nature of these interactions points to the existence

of RTSs, which are focused largely around regional destinations (Carson et al., 2003).

There has been some past research on the information needs of key agents in Australia's RTS. The Centre for Regional Tourism Research (Prosser, 2000) conducted a national research roadshow in 1999 that included participation from over 500 regional tourism operators and association managers. In 2001, the Australian Regional Tourism Convention in Port Macquarie (Kelly, 2001) included a national forum that identified the broad information needs of regional and local tourism associations. The results of these two initiatives were supplemented by a series of focus groups in 2002 and 2003 to determine the current data or information needs in regional tourism, and the perceived barriers to obtaining and using this information.

All three investigations highlighted the difficulty organisations (particularly small businesses and local tourism associations) have in articulating their data and information needs and in procuring information to address these.

## THE ROLE OF THE TOURISM INFORMATION MARKETPLACE

Externally sourced, or secondary, knowledge and information is important to innovation at the enterprise level and, consequently, to the RTS. For entities engaged in the Australian tourism industry, the potential for secondary

information to contribute to innovation is growing in line with global trends (Scott, 1999, p. 14). Secondary information can help to establish a competitive advantage in a globalised, competitive, and demand-elastic industry; benchmark against other regions or competitors; promote evidenced-based approaches to management and reporting; develop or diversify products or services; and guide future decision pathways. The effective procurement and application of secondary information relies on an efficient marketplace that facilitates its exchange. The TICM is a conceptual model depicting the processes involved in the exchange of tourism information commodities.

At a broad level, the TICM (see Figure 1) is similar in structure to other commodity marketplaces. Suppliers offer information commodities in the forms of publications, tabular data, research products, and case studies. Demand for these is generated by the information needs of tourism businesses, research bodies, and other organisations. The exchange of information commodities is facilitated by intermediaries such as technology-based systems (for example, online bookshops) and organizationally based facilitators (such as regional tourism organisations).

Neoclassical economic theories on marketplaces focus on how marginal price changes affect the demand and supply for commodities. A marketplace is said to be operating efficiently when all the commodities offered to the market are cleared. The price at which this occurs is the equilibrium price (Mansfield, 1985). These rudimentary

Figure 1. A conceptual model of the TIM
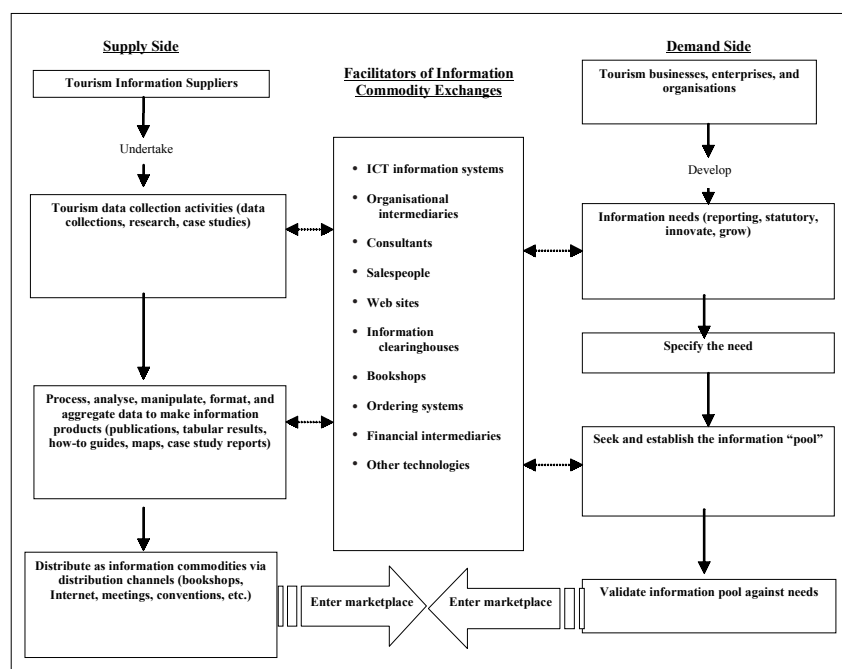
economic theories rely on several assumptions, including that suppliers and consumers have perfect information available on which to base their decisions, and consumers are rational to the extent that they consistently seek to maximise their marginal utility.

Even with such assumptions in place, marketplaces in which the commodity is information are inherently different (Shipario & Varian, 1999). Reasons for this include that information is an "experience good" that must be consumed before you realise its value; the price of information tends to move toward the marginal cost that can be close to zero for some information commodities; and many suppliers of information commodities do not engage in the marketplace with the intention of profit maximisation (Edquist, 1997).

The uniqueness of information as a commodity means that the efficiency of the marketplace in which it is exchanged cannot be ascertained in terms of its ability to reach a state of equilibrium. An alternative approach is to assess whether information can be procured in the marketplace efficiently. If this was the case, tourism enterprises, after identifying their information needs, would be able to specify them to suppliers in a common language; readily assess the pool of information commodities available to address their needs; and apply relevant knowledge and skills to validate each information commodity to determine its appropriateness and relevance. Price impacts on the behaviour of the marketplace (especially consumers) become subservient to procurement activities, which are outlined in the model.

A closer examination of the Australian TICM and supporting literature reveals that the steps toward information commodity procurement are not efficient. Demand-side leakages are evident, masking the true demand for tourism information commodities. Leakages cause demand "drop out" on the demand side of the model. They are evident in each of the "specify," "seek," and "validate" phases (see Figure 2).

Causes of TICM leakages are identified in brackets in Figure 2 as follows:

- **Language (specify stages):** Carson and Sharma (2001) note that the supply of tourism information commodities in Australia is not bounded by a standard data model. Several attempts to produce standard classifications of tourism information have, nevertheless, been made. These include the Framework for Australian Tourism Statistics (Australian Bureau of Statistics, 2003), the National Tourism Information Model (Carson & Sharma, 2002), and the work of Scott (2000). The National Tourism Information Model, in particular, has recognised the importance of a "universe of discourse," or common language, for the efficient distribution of tourism information.

Figure 2. Leakages in the tourism information marketplace
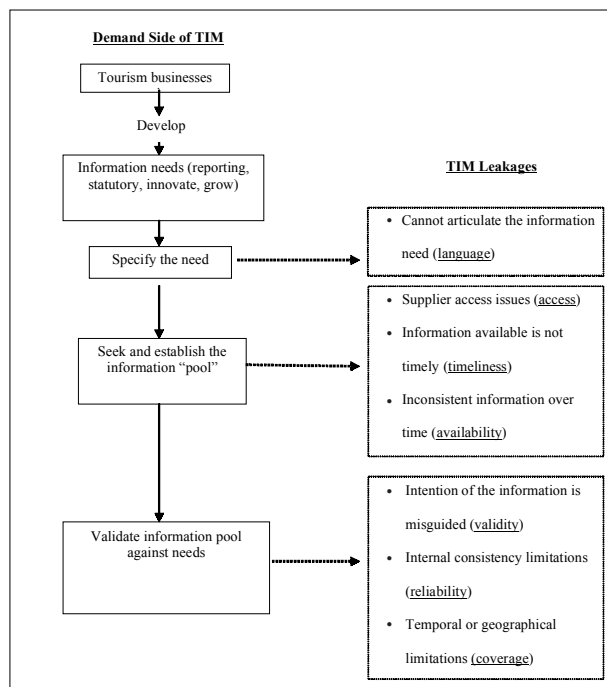
- **Access (seek stages):** Efficient procurement of tourism information requires well-organised and defined access points to supplier commodities. After identifying and specifying their information needs, consumers must seek relevant information commodities from suppliers. Access to key information about the set of appropriate commodities can be obtained from intermediaries or directly elicited from suppliers. Degrees of access vary, ranging from direct access to information experts to no means of access at all. To highlight the magnitude of the access issue, the Decipher project in Australia currently provides a single point of access to information commodities from more than 150 suppliers (www.decipher.biz, April 2004).

- **TICMeliness (seek stages):** Timeliness describes the temporal lag between data collection and the public release of the data in the form of information commodities. The importance of timeliness to the tourism industry is underlined by the impacts of recent geopolitical shocks. These have underscored the high elasticity of demand for international tourism products. To respond effectively, tourism businesses require information on current and likely future implications. Until recently, lags of 12 to 18 months were not unusual for national-tourism-specific data sets. This situation is improving with

advances in technology and increased experience in data management.

- **Availability (seek stages):** Relates to the assurance that information commodities are based on data that will continue to be collected and made consistently available. Recent funding cutbacks to public-sector suppliers have restricted their capacity to continue to deliver some knowledge commodities.
- **Validity (validate stages):** Validity describes the degree to which information consumers can ascertain the value of the information commodities relative to the current information needs. Information not produced specifically for tourism may still be highly valid where it contains generic "lessons." Prominent suppliers usually provide guidance on the validity of their products through metadata.
- **Reliability (validate stages):** In terms of statistical reliability, technical considerations include sample size, sampling procedure, benchmarking processes (if used), and issues of bias in data collection. A range of technical skills at the user end is required to assess reliability issues. This may be further complicated by the intended application for the information. For example, sample sizes may determine a data set to be reliable at the national level but not at the regional level. Tourism firms and organisations have been found to be lacking in their understanding of the impacts of reliability issues (Scott, 1999, p. 21).
- **Coverage (validate stages):** Relates to both the geographic scope and temporal scope of the information. National and state data sets are usually established for purposes of national- and state-level analysis, and coverage at regional levels suffers as a result. Some knowledge products contain generic, or globally, relevant content. Temporal coverage involves the time frame of reference for the data collection. This can be particularly important in tourism analysis because of seasonality effects.

THE POTENTIAL FOR ICT TO FACILITATE EFFICIENT TOURISM INFORMATION COMMODITY EXCHANGE

Coupled with the global shift to knowledge-based economies, there has been growth in the trade of information. Where previously, in capitalist-based economic systems, knowledge was an input to the development of industrial assets (such as machinery), knowledge in the information economy is the tool of specialist workers. Such workers seek, procure, and apply knowledge to wealth-creation

processes, such as developing new production techniques and organisational structures and establishing competitive advantage. Processes that facilitate these outcomes can be described as innovative processes. This approach represents a major paradigm shift insofar as knowledge and innovation are no longer exogenous to core economic processes.

Technologies such as online ICT systems have led to a proliferation in the availability of information by reducing storage, transfer, and handling costs. The World Wide Web is an obvious functional example. While information may still be relatively expensive to produce, it is cheap to reproduce (Shipario & Varian, 1999, p. 3). At the enterprise and organisational levels, information may be sourced from within the organisation as tacit or "prior related" knowledge (Brockman & Morgan, 2003) or from outside as secondary information.

A small suite of online tourism information systems has been developed around the world. Each system offers the capacity for technology-based solutions to the challenge of placing appropriate business intelligence in the hands of tourism enterprises and organisations. As a group, these systems demonstrate the capacity for ICT to address or minimise leakages in the TICM. Table 1 summarizes these and briefly indicates their main features.

CONCLUSION: AN ASSESSMENT OF THE IMPLEMENTATION POTENTIAL OF TOURISM ICT SYSTEMS

"Implementation potential" can be described as the likelihood that a particular innovation will be adopted in the system for which it was intended and in a way that is similar to its intended purpose. A closer examination of the Decipher ICT system in Australia substantiates that systemic barriers to implementation potential may reduce the capacity of ICT systems to be diffused in systems. Consequently, the innovative potential of such systems is diminished.

The Decipher ICT system meets a regional tourism need that has been consistently identified as a high priority (see, for example, Department of Industry Science and Resources, 2003; Prosser, 2000). From the neoclassical viewpoint, this market demand and product superiority would be considered sufficient for the technology to be widely diffused and adopted in the system. However, the tendency has been for developers of online tourism initiatives to encounter difficulties in achieving widespread uptake, despite the market need. To a degree, this is illustrative of the complexity inherent in RTS and the inability of the system to facilitate diffusion of technol-

Table 1. Summary of existing online tourism information systems

ICT System	Features and Strengths
Decipher (Australia) (*www.decipher.biz*)	• Information from over 150 suppliers • Delivered in context through intelligent user pathways • Dynamic report-building and resource-tracking functionalities
Tourism Studies Austria (*http://www.studien.at*)	• Database containing studies, research reports, and conference reports • Searchable in multiple languages on title, keywords, summary, date of completion, etc.
Canadian Tourism Exchange (*http://www.canadatourism.com/en/ctc/ctx/ctx-ind_watch/tourism_stats/index.cfm*)	• Business-to-business network for the Canadian tourism industry • Access to a series of applications offering significant added value to its members • Access to a series of html reports, statistical tables, publications, online professional development courses, and events calendars
Tourism Research Liaison Group of the United Kingdom—StarUK (*http://www.staruk.org.uk/*)	• Delivers research reports and statistics in pdf and html formats
Tourism Studies Institute Spain (*www.iet.tourspain.es*):	• Users can search for tables and pdf reports • Sophisticated tools for manipulating tables
Tourism Research Council New Zealand (*http://www.trcnz.govt.nz/*)	• Delivers publications and standard tables in html, pdf, and Citrix database format • Index of research and publications from other sources • Resources organized according to topic areas

Table 2. Potential of ICT systems to resolve TIM issues

Tourism Information Dissemination and Application Barriers	Potential ICT System Solutions
Language	• Common discourse (e.g., NTIM) used to execute standard functionality (searches, retrieval of resources, etc.)
Access	• Single location access to resources from multiple suppliers • Ability to facilitate and broker supplier–consumer interactions
Timeliness	• Encourages suppliers to release soft-copy information commodities • Facilitate "on time" public availability through automated delivery channels
Availability	• Ability to deliver related resources where availability is poor • Access to previous versions and trends (e.g., time-series data)
Validity	• Potential to restrict the application of resources with poor validity • Contextualization of validity issues to tasks
Reliability	• Provision of metadata to assist with validation • Access to related resources where reliability is poor • Potential for automated warnings about reliability
Coverage	• Provision to "push" resources with generic and extra-regional relevance • Potential to build industry knowledge on seasonal impacts

ogy for innovation (Daniele, Mistilis, & Ward, 2000; Sharma, DeLacy, & Carson, 2000).

Based on the Decipher experience, Table 3 details some of the impediments to more widespread diffusion and application of online information innovations in a systemic context.

Two main conclusions can be drawn from these discussions. First, the analysis of the TICM construct illustrates that a focus on increasing the production of information commodities without addressing the barriers to efficient exchange, uptake, and application may represent an imprudent investment of resources. This brings into question the policy of growing the stock of tourism information as purported in the White Paper. It also provides a generic lesson for developers of ICT systems insofar as information dissemination technologies can only be considered to be successful if they recognise the uniqueness of information as a commodity and address the barriers to exchange.

Second, as the Decipher case indicates, there is no guarantee that ICT systems will achieve their implementation potential. Developers must consider the capacity of the system to adopt, use, and apply the technology according to the purpose for which it was designed. In

Table 3. RTS impediments to the implementation potential of ICT systems (derived from Carson et al., 2003)

Regional Tourism System Characteristic	Factors Impacting on Implementation Potential
Commercial imperatives	• Most ICT projects require (at least) a part-return on investment; there is a poor history of users (especially small firms and local tourism associations) purchasing research and business intelligence
Information rich vs. knowledge poor	• Inability of tourism information consumers to muddle through the leakages in the TIM and to apply skill sets to develop knowledge and learning
Regional dispersion	• A key barrier to all ICT uptake in regional tourism (see Sharma & Carson, 2002; Carson, Sharma, & Waller, 2002); affects marketing, training, and the cumulative uptake of technologies
Structure of the tourism industry	• Large numbers of small firms with generally poor ICT skills • Low levels of contact between ICT system proponents and users
Sourcing of innovation champions	• Reluctance among user groups to provide a lead-user role in the diffusion of innovative technologies • Low levels of risk-taking behaviour associated with high elasticity of demand for tourism products
"Technophobia"	• Inability to achieve a critical mass of users because of a poor understanding of the potential for technology-driven innovation
Tourism institutional stagnation	• While imperatives for innovation are recognised in policy circles (Department of Industry Science and Resources, 1999), institutions focus on ICT development to facilitate product marketing and bookings

RTS in Australia, the problems may be particularly acute. Addressing these may require coordinated strategies from policy makers, peak industry groups, and key tourism organisations. While ICT systems can demonstrate the need for such responses, their ability to progress the system toward this is beyond the influence of ICT developers.

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KEY TERMS

Information: Contextualised data that can be analysed and applied to decision-making circumstances.

Innovation Implementation Potential: The likelihood that a particular innovation will be adopted in the system it was intended for in a way similar to its intended purpose.

Knowledge: The outcome of the application of skills and resources to transform what were contextualised facts (information) into resources for learning.

Marginal Utility: The relative satisfaction gained from consuming additional units of a commodity. For many commodities, marginal utility diminishes (for example, a cream bun).

Metadata: Data or information that is about data. For example, a table of standard errors, a definition, and a library classification system are all examples of metadata.

Regional Tourism Systems (RTSs): RTSs in the Australian context are sectoral networks of organisations and institutions that interact or are interdependent, where the hub of such interactions is located outside of major cities.

System of Innovation: A conceptual framework in which networks of firms, organizations, and other parties apply tacit and secondary knowledge to interactive learning processes to generate favourable economic outcomes.

Tourism Information Marketplace (TICM): A conceptual model depicting the entities that participate and interact in the processes that facilitate the exchange of tourism information commodities.

An ICT Enabled "Community" in Rural Nigeria and the UK

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INTRODUCTION

Development initiatives in Nigeria tend to be delivered down through layers of administration, from federal government, to state government, to local government, before they get implemented. Often developments are concentrated in urban areas rather than rural communities.

CawdNet[1] aims to link top-down research and development initiatives with people at the rural grassroots, not just through NGOs working with the "grassroots" community, but also by opening up existing communication channels amongst farmers, women, teachers, health workers, and young people, and integrating them into the communication channels of the connected community (McLean & Johnson, 2004). CawdNet[3] has worked across the digital divide in its internal organisation, since 2001. Increasingly CawdNet is looking outwards and as a result members of the rural communities and members of various "connected communities" are becoming directly involved in these information flows.

THE CONTEXT OF CAWDNET: THE WORK AND WORKERS

CawdNet is an informal group, a "community," whose existence has been enabled through Information and Communication Technology (ICT). The core members of CawdNet collaborate on work concerned with farmers, women, micro-credit, livelihoods, youth, health, education and other aspects of community development. The CawdNet core members are from Oke-Ogun Community Development Network (OCDN), Fantsuam Foundation (FF) Rural Searchlight (RUSEL) and CAWD volunteers. Although most of the core members are in local community development organisations in rural Nigeria, there are two CAWD volunteers in the UK, who act as a (proactive) link between the Internet and CawdNet in Nigeria. All CawdNet core members in Nigeria have some kind of e-mail link with CAWD volunteers, even if their access to e-mail can only happen infrequently because of difficult journeys to a cyber cafe.

There are very few paid "CawdNet workers."[4] Most work with their CawdNet organisations happens "as and when" that work can be fitted in around other responsibilities and "day jobs." All CawdNet workers, except for the CAWD volunteers, are active in rural Nigeria.

"CawdNet friends" are comprised of individuals, groups or organisations that are helping (or have helped) to forward CawdNet's work in some way. Friends may have a formal or informal relationship with CawdNet, or with one or more of the organisations it represents. Many CawdNet friends are engaged in some kind of information exchange, free of charge, which enhances CawdNet's work. Free information exchange can range from someone sending occasional e-mails, with advice or information, to a graduate student working with the project for weeks or months at a time. Some friends help in cash or in kind. Voluntary Service Overseas (VSO) has been a much-valued friend in this way, but information is a more usual form of help. Most, but not all, of the CawdNet friends who give information are involved in some aspect of development in a professional full-time way. Some are exploring ways to collaborate on various planned projects.

Acquaintances of CawdNet are those we know less well, familiar names from discussion lists, or contacts at face-to-face meetings, people we have exchanged ideas with in a public way, who have helped to influence our thinking, but not in the personal, specifically "CawdNet directed" way of friends.

CawdNet, ICT AND COMMUNICATION

CawdNet's initial existence and subsequent development is totally an outcome of ICT. It is not a traditional organisation or group where communication, and the relationship to information, is simply enhanced by ICT. Without e-mail CawdNet could not have come into being. Without the Internet, CawdNet could not have learnt so much about the "development world" of which it is a part. Without mailing lists and discussion groups CawdNet could not have started to make a place for itself within the wider context of the "development world." It could not have established many of the relationships that it values highly. Without those relationships, and the

opportunities afforded by e-mail, it would not be exploring the various collaborative projects on community development that are currently under consideration.

CawdNet uses e-mail for internal communication. This is not desk-to-desk office e-mail communication. CawdNet workers typically have to travel to cyber cafes to send e-mails. This is necessary because their community work is based beyond the reach of the telecommunications infrastructure. VSAT links are making e-mail increasingly available. This means that access is gradually improving, regarding distances travelled, but expense is still a great barrier. As e-mails become easier for more people to send, there is a gradual increase in information exchange in the CAWDNET network. Also with increased access, more CawdNet workers, beyond the CawdNet core members, are communicating with CAWD volunteers. This improves the quality and quantity of information exchanged between the rural areas and the connected community.

The CAWD volunteers in the UK began their work through links of friendship with Peter Adetunji Oyawale, not through prior knowledge of the development initiatives. Hence there was a need for extensive effort to learn about the Nigerian development issues using e-mail and the Internet, which is supplemented by "on the ground" understanding in Nigeria. For most CawdNet workers in Nigeria, surfing the Net is excruciatingly slow and prohibitively expensive. Therefore, the CAWD volunteers undertake Internet work for other CawdNet workers and the communities they serve. The resulting information is forwarded by e-mails and on CD-Roms. Using such processes volunteers are often able to find out about free material that can be supplied to them and which they would not otherwise have known about if they had relied upon traditional government services.

The e-mails to CAWD volunteers from the community are currently both short and few in number, but this traffic is increasing as access, knowledge and trust increase. It is important to understand that to the volunteers every e-mail is significant not just for what it says, but also for what it represents. The two following examples give some context to this:

1. The farmer society of Ago-Are are progressing and we are preparing for harvesting of yam and maize. Mr. Oyawale also said you should help him greet the Oyawale's family over there. Bye.

To the volunteers a personal greeting such as this plus a sentence about the harvest represents the very first report from the Farmers' SIG (Special Interest Group). It is evidence that the representatives of this group are trying to keep in touch. There is communication across the digital divide. Most of the people in the Ago-Are farmers group are illiterate and struggling in poverty, yet repre-

sentatives of this group are making the effort to send traffic along the information "footpath" (it is far from being an "information highway" yet).

2. Dr E.Akioya:-"pls lorain can i get any free cd rom on HIV/AIDS,and polio. i was directed by pam.I am a medical doctor in nigeria.pls also keep me posted on other available health cds."

An e-mail from a doctor, requesting specific information, is evidence that the Health SIG is beginning to "pull" information, where previously the information had been "pushed" by the volunteers.

Discussion lists, virtual conferences and other interactive exchanges on the Internet have two important functions for CawdNet. First there is a lot to be learnt from acquaintances in this way. Secondly, some of these acquaintances develop into friends. Fantsuam Foundation and CAWD volunteers were Internet acquaintances long before they started working closely and the name CawdNet was adopted. Most of CawdNet's friends began as acquaintances on the Internet. This is even true of friends based in Nigeria, including some who are in fact geographically close to CawdNet core members.

In the connected community, CawdNet has friends and acquaintances from many parts of the globe, including Nigeria, and from many sectors: academia, development organisations, the Diaspora, alternative technology groups, ICT professionals, Open Source groups, research and development people, publishers, health professionals, social entrepreneurs, and others, each with their own particular area of interest which relates in some way to rural development. Most of these contacts have come through the work of Fantsuam Foundation and CAWD volunteers, actively reaching out to the connected community. Others have come unexpectedly, through people finding CawdNet through the Internet, via the Web sites of FF, or CAWD, or through the e-newsletter.

There are many virtual communities. What makes the small CawdNet community unusual is the boundaries that it crosses, by working both in the connected communities and in rural Nigerian communities. CawdNet has links, through personal networks, beyond the telecommunications infrastructure. Someone in the connected community who links with CawdNet, links with the formal and informal networks of rural Nigeria. OCDN, FF and RUSEL are grassroots organisations, led by people deeply embedded in their communities. They are networking with the poorest and most un-empowered members of their communities-subsistence farmers (men and women), petty traders, and unemployed youths-as well as knowing the elites, the highly educated, the professionals, business people, traditional rulers, chiefs,

politicians, administrators, religious leaders and community committees.

Another unusual feature of CawdNet is that the roots of its work are with the poor. RUSEL and FF both began as micro-credit organisations. CAWD was started by Peter Adetunji Oyawale, who was the son of a poor and illiterate farmer. Peter started the work in Oke-Ogun (now led by Oke-Ogun Community Development Network) because he wanted to help people like his parents and his friends from primary school to have a better future, and he believed that ICTs had a part to play. It was Peter who had the vision, and who made the initial links across the digital divide, from which CawdNet developed.

LOOKING FORWARD

CawdNet is a developing network so its form and its function are evolving. It is influenced by the ideas and examples of social entrepreneurs (Bornstein, 2004). Social entrepreneurs fit somewhere between the conventional models of "a charity" and "a business." CawdNet sees itself becoming increasingly involved in a mixture of new enterprises:

- Some charitable (such as subsidising education and training opportunities).
- Some sustainable businesses (perhaps related to alternative technologies; some perhaps providing an umbrella/franchise arrangement for small businesses, in enterprises that are more ambitious than the present micro-credit enabled opportunities; some others. Various ideas are emerging).
- Some hybrids of charity/business.

The businesses that CawdNet sees itself supporting tend to be small scale, in harmony with "Small is Beautiful" ideas of economic development (Schumacher, 1973).

CawdNet hopes the way forward will be one of increasing collaboration, of a situation where people who have knowledge of development (in whatever way), or a desire to support it financially, will join with people who know the realities of rural Nigeria (because it is the life they lead). This is already happening, but we hope it will greatly increase. CawdNet does not see its rural communities as passive potential recipients of development aid, but as partners and potential "rural consultants." Together with development workers they can try things out. In addition to being involved in the normal grant making and investment programmes, they could work within cross-cultural teams for a practical research and development, "R and D," approach to development (along the lines of what educators might term "project-based learning"). Such collabora-

tions could lead to genuine problem solving on various issues of sustainable development and the Millennium Development Goals.

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ENDNOTES

[1] CawdNet is not a formal organisation. The inclusive group term "CawdNet" was adopted because the people involved needed to be able to say "we." The name came about because one of the benefits of working together is an increased ability to network-hence the "Net." CawdNet traces its roots back to the vision of the late Peter Adetunji Oyawale and his original "CAWD" the Committee for African Welfare and Development—hence CawdNet. The name CAWD lives on through CAWD (Charity for African Welfare and Development, registration no 1104228) which was set up in June 2004 to fundraise.

[2] Dada McLean Ltd—Knowledge Brokers (UK registered company active in UK and Nigeria) is a key sponsor of CAWD. Web site www.dadamclean.com

[3] Additional information can be found through the Web sites of CawdNet http//www.cawd.net, Fantsuam Foundation http://www.fantsuam.org/ and CAWD www.cawd.info. Up to date information is available by subscribing to the oocd2000plus e-newsletter (named after Oke-Ogun Community Development Agenda 2000 Plus) http://lists.kabissa.org/mailman/listinfo/oocd2000plus

[4] "CawdNet worker" is an informal term used to describe anyone who is working with one of the projects represented in CawdNet.

ICT for Ethiopian Community Development

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INTRODUCTION

Ethiopia is the home of Lucy's discovery claimed by science as the oldest female in the search for human beginning—dated 3.2 million years (Johanson & Edey, 1981; Foley, 1997, 2004); headquarters for Organization of African Union since its inception in 1973 (Encyclopedia Britannica Online, 2004); credited for the world heritage site of the churches of Lalibela, a building technology of ten churches hewed from solid rock (Salmon, 2003; United Nation Population Fund, 2001); the only African nation that did not succumb to colonialism, a nation with 13 months of sunshine, and a nation with a long history (Pankhurst, 1961 & 2004; Tegenu, 2004).

Its prominence notwithstanding, Ethiopia today is among the poorest nations in the world. Eighty-two percent of its population lives with under US$1.00 per day (International Labor Organization, 2000). Eighty-five percent of its population lives in rural settings. With 70 million current population and a growth rate of 2.7% to 3.1% per annum Ethiopia's population is expected to more than double by 2030 (United Nations, 2000). The current rate of population growth threatens Ethiopia's economic stability according to Ethiopia's President, Mr. Girma Wolde-Giorgis (Wolde-Giorgis, 2003).

The Ethiopian government has taken a bold step to reinvent its services and processes utilizing Information and Communication Technologies (ICT). The government is investing U.S. $130 million to build ICT infrastructure (Negash, 2004a). ICT has been proposed as a means to help Africa overcome its underdevelopment (Polikanov & Abramova, 2003). At the same time, the paucity of Internet infrastructure in countries with developing economies is known to limit technology diffusion (Mosaic Group, 1998). This leaves a major question for policy makers: Will ICT properly applied bring Ethiopia out of its underdevelopment?

This article presents two models. First, an ICT assimilation model to assist top management in understanding ICT complexities; and second, a Communities of Practice model to engage the diaspora in content delivery. The author participated in the assessment of three national projects, March 2004 to June 2004, and engaged in Communities of Practice to deliver videoconferencing training between Ethiopia and the United States, November 2003 to June 2004. The first model, the ICT assimilation model, is based on the three ICT project assessments. The second model, the Communities of Practice to utilize ICT, is based on the delivery of videoconferencing training. This article presents the lessons learned from one of the videoconference training projects.

The remainder of this article is organized in five sections. Section one provides an ICT background on Ethiopia; section two, ICT assimilation, provides a model developed to support top management understanding of ICT management; section three discusses a case study utilizing ICT for content delivery by Communities of Practice-a model proposed to overcome underdevelopment using ICT; section four, development challenges, highlights potential challenges of ICT implementation; and finally a conclusion is provided.

BACKGROUND

The three Ethiopian ICT projects included in the assessment are as follows:

1. The *SchoolNet* project designed to connect 574 high schools in Ethiopia,
2. The *WoredaNet* project aimed at connecting 597 counties in Ethiopia, and
3. The *Broadband* project which is concerned with delivering high speed Internet access to Ethiopia.

The *SchoolNet* project which was managed by the Ministry of Education aimed to connect all high schools, 574 high schools at the time of this writing, through satellite connection that used very small aperture terminal (VSAT) technology. The *SchoolNet* project delivers teaching lessons via satellite. Quality assurance was controlled at the central broadcasting location. Lessons were broadcasted to each school and archived for re-run at later times. In this setting, rural schools will receive

the same quality of education as their urban counterparts. At the time of writing *SchoolNet* project was in its final phase of implementation, six subject areas were developed and a pilot test was in progress. The effectiveness of broadcasted education with local assisted learning is yet to be seen.

WoredaNet managed by the Ministry of Capacity Building aims to connect 597 counties (called Woredas). *WoredaNet* used VSAT technology to link rural locations. *WoredaNet* exploited ICT's capability to connect geographically dispersed locations through videoconferencing. By bypassing the transportation hurdle, which may take several days to travel from some of the rural areas, videoconferencing intends to provide civic leaders with the ability to conduct business without leaving their offices. Videoconferencing communication is expected to reduce the travel of officials away from their local communities.

The *Broadband* project intended to provide high speed Internet access at reduced costs. Ethiopia announced broadband services in May 2004. Ethiopia used terrestrial-optical technology and satellite connection to link to the global Internet network.

The ICT development gap between countries with developing economies and industrial countries is significant. For example, in 2004 the number of Internet users[1] in Africa was estimated around 1.3 million from a population of 768 million, i.e., only 0.17% or 1.7 persons per thousand population of Africans have Internet access. This is alarming when compared to an industrialized country like the U.S. where every other person, 50% of the population, has Internet access (Computer Industry Almanac, 2000). Africa, with 12.8% of the world's population (United Nations Population Fund, 1999), accounts only for 1% of the global Internet users (Polikanov and Abramova, 2003). The number of Internet subscribers in Ethiopia in 2000 was a meager 2,500 at a time when the population was 60 million (Jensen, 2001). This represents about one in 25,000 people.

In 1996, only 11 nations in Africa had access to the Internet, but by 2003 all 54 nations had Internet access (Polikanov & Abramova, 2003). While this represented a commendable progress, Internet access to the public at large and availability of computers was not widespread. In East Africa, Kenya and Uganda lead ICT use while Tanzania and Ethiopia follow. However, it needs to be noted that a large number of Internet users in Kenya and Ethiopia are international organizations and humanitarian agencies located in Addis Ababa and Nairobi (Polikanov & Abramova, 2003). This further demonstrates just how low Internet access is to the general public. According to government officials from the Economic Commission for Africa, use of the Internet in Ethiopia accounts for only 1% and Internet for adminis-trative purposes is extremely low (Polikanov & Abramova, 2003).

In 2000 the average dial-up cost in Africa was US$68 per month (Jensen, 2001) compared to about US$20.00 in the U.S. The cost differential for Internet access between the U.S. and African countries is magnified when the cost is adjusted for individual income. These cost differentials are largely due to government monopolies (Jensen, 2001). Ethiopia and Mauritius, for example, have an official monopoly on Internet services (Polikanov & Abramova, 2003).
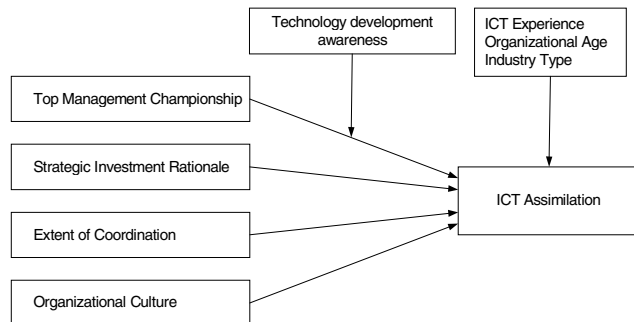
A MODEL FOR ICT ASSIMILATION

ICT has become essential for business operation in many sectors. The author was invited to assist in the ICT assimilation effort at the various ministries in Ethiopia. Several brainstorming and interview sessions were conducted with management executives who were responsible for ICT projects. Findings from the interviews and experience from the videoconference trainings led to a quest for a model to explain ICT assimilation. This section extends the Chatterjee et al. (2002) model for ICT assimilation in countries with developing economies by including the organizational culture and technology development awareness framework used in the Ethiopian ICT projects (Negash, 2004a).

ICT serves as a key tool and enabler for continuous country development (Kasim, 2004). In industrial countries ICT diffusion has shown a significant positive impact on gross domestic product (Jalava and Pohjola, 2002; Oliner and Sichel, 2000; Pohjola, 2001) and plays a critical role in economic growth (Grossman and Helpman, 1991; Barro and Sala-i-Martin, 1997). ICT investment has greatly contributed to the economic growth of industrial countries like the United States (Sichel, 1997) and it may provide better economic opportunities for countries with developing economies (Lee, 2001). ICT implementation is not free, however. It requires investment in human capital and research and development (Redding, 1996) by the host country. If the host country does not have the domestic capability to absorb the technology spillover then the ICT diffusion will be futile (Abramovitz, 1979).

Chatterjee et al. (2002) used structuring, metastructuring, and institutional theory to explain how top management championship, strategic investment rationale, and extent of coordination affect Web assimilation. The proposed ICT assimilation model (Figure 1) extends the Chatterjee, et al. model by including two constructs: (i) the impact of organizational culture and (ii) the moderating effects of technology development awareness on top management. In this article only the

Figure 1. ICT assimilation model based on Chatterjee et al. (2002)

Figure 2. Technology development awareness framework

Part I		A	B	C	D
Project **Project name**	**Expected outcome**	**Infrastructure**	**Network**	**Content development**	**Content delivery**
Responsible group		*City*	*End-user*	*End-user*	*End-user*
Project CityWater	Purified water to all residents	Layout pipes throughout the city	Install plumbing within the residence	Setup to provide different brands of water	Install faucet and labels for each brand
Responsible group		*Telecom*	*Education Ministry*	*Education Ministry*	*Education Ministry*
Project SchoolNet	High caliber education for ALL schools	Satellite connections between 574 high-schools {e.g., VSAT}	Connect the classrooms {e.g., LAN or WAN}	Engage subject matter experts to develop different subject areas	Install viewing screen for user interface

Part II		E	F	G	H
Project: **Project name**	**Expected outcome**	**Security**	**Policies and guidelines**	**Support & maintenance**	**Enhanced services**
Responsible group		*City*	*City*	*End-user*	*City*
Project CityWater (continued)	Purified water to all residents	Protect water from contamination	Develop policies and guidelines to distribute water equitably	Customer service and repair for plumbing	Exchange water brands with other cities and markets
Responsible group		*ICT authority*	*ICT authority*	*Education Ministry*	*Telecom and ICT authority*
Project SchoolNet (continued)	High caliber education for ALL schools	Maintain data integrity	Develop policies and standards for fair and ethical use	End-user support, upgrades, and maintenance	Interactivity and multimedia access {ComputerLab} {Internet Link}

technology development awareness framework is discussed (See Negash (2004a) for a discussion on the organizational culture construct).

To succeed in e-initiatives executives must be clear about "why we are doing" and "what we are doing" (Butler, 2000). During interviews for this article many top management personnel used "e" buzz words like e-government, e-citizen, e-school, and e-business, however, the perceived meanings for these terms was not consistent among the executives. Like the management of most "brick-and-mortar" companies, leaders of many countries with developing economies know they must do something "e" quickly (Butler, 2000). But many may not have a clear understanding of what projects to undertake, why they should do them or even what projects are in progress in their countries. The interviews for this research found that there was a prevalence of confusion among executives about the overall aim, value and desired output for projects. To better explain ICT assimilation, this article extends the Chatterjee, et al. model by adding a moderating factor—technology development awareness. Detailed example of the modified technology development awareness framework is shown in Figure 2.

The framework identifies the project name, its expected outcome, the group responsible for execution, and delineates the project using eight functional areas: infrastructure, network, content development, content delivery, security, policies and guidelines, support and maintenance, and enhancement services. The manner in which the eight technology development awareness functional areas can be applied will now be illustrated using a generic project, Project-CityWater. The technology development awareness framework focuses on the expected outcomes. This framework gives management an overall awareness about technology development and action plans to monitor project progress.

The first step in the CityWater project would be to layout the water pipes throughout the city, the infrastructure component. This is the responsibility of the city. Individuals and businesses that wish to benefit from CityWater must install plumbing within their buildings, the network component. Setting up labels for hot and cold water or for the supply of different brands of water and installing faucets are the responsibilities of the end user shown in this framework as content development and content delivery, respectively. Security to protect citizens from water contamination and policies and guidelines for equitable distribution of water have to be established, labeled as security and policies and guidelines in this framework, respectively, both components are the responsibility of the city.

Finally, customer support to address plumbing issues and enhancements in water services have to be addressed to sustain the services of CityWater project. These are labeled support and maintenance and enhanced services, respectively. Support and maintenance is the responsibility of the end user while enhanced services are the responsibility of the city.

Using the technology development awareness framework the CityWater project provides a generic example that can easily be understood by non technology executives. Similarly complex ICT projects like *SchoolNet*, *WoredaNet*, and *Broadband* can be explained for top management. An example from the

SchoolNet project is shown in Figure 2. Just as the pipes were needed to build the infrastructure for CityWater project, VSAT technology was used to link the schools. Connecting the classrooms is analogous to installing plumbing in the CityWater project. Connectivity for *SchoolNet* could be through local area network (LAN) or wide area network (WAN).

Instead of the technically challenging terms like VSAT, LANs and WANs top management could use simple analogies like pipes and plumbing to create broader awareness. Similarly content development, content delivery, security, policies and standards, support and maintenance, and enhanced services provide top management with an easy framework to understand and delegate the management of complex ICT projects.

This article posits that top management's level of awareness in these eight components moderates their beliefs and participation and proposes extension to the Chatterjee et al. (2002) model when considering ICT assimilation for countries with developing economies.

UTILIZING ICT FOR DEVELOPMENT: COMMUNITIES OF PRACTICE

"Brain drain" at all levels, from policy making down to end-user, has been identified as the greatest problem hindering ICT penetration in Africa (Jensen, 2001). Rural areas in particular suffer from limited human resources. Along with the very low pay scales in the African civil service, brain drain has been a chronic problem for governments who continually lose their brightest and most experienced.

In Communities of Practice individuals who belong to different organizations come together because of their practice overlaps that bind them into combined efforts (Wenger, 1998). The American Productivity and Quality Center (2001) posit that Communities of Practice are becoming the core knowledge strategy for global organizations. "Communities of Practice, is one of the fast-growing socio-economic life forms, and can become not only a potent source of value creation in today's knowledge economy, but also the model for the very future of the modern organization …. Communities of Practice are here to stay." (Por, 2001). Groups that engage in sharing and learning through Communities of Practice create organizational value (Lesser and Storck, 2001). "Communities-of-Practice emerge and evolve in organizations as practitioners collaborate and share work experiences through extensive use of narration about issues and problems involved in doing the job" (Mathiassen, 1998, p. 88).

To begin addressing the brain-drain problem in Ethiopia, this article looked at Communities of Practice that

linked several institutions in the U.S. and Ethiopia through videoconferencing. Training using videoconferencing technologies has been found to be successful (Clifton, 2003). The specific training program in this article involved a six-week training with two hours per week, provided to physicians in Ethiopia. Twenty-one senior physicians from Ethiopia registered for the training. The training was conducted using a two-way videoconferencing technology with Kennesaw State University serving as the videoconference gateway.

Participants of the case study belonged to different organizations but came together for reasons of their practice (Wenger, 1998). Two non-profit organizations, the Bethany Negash Memorial Foundation, Inc. [2] and Ethiopian North American Health Professionals Association[3] organized the training. The Ethiopian North American Health Professionals Association identified participants, developed the course content, and scheduled expert speakers. The Bethany Negash Memorial Foundation, Inc. coordinated the technology use, setup videoconference centers, connected the different institutions, setup virtual forums, and archived training sessions.

The HIV/AIDS pandemic has been wrecking havoc worldwide. This has been most evident in countries with developing economies where economic disparity limits access to treatment and care. To quickly address this pandemic the HIV/AIDS medical management training was designed as "train-the-trainer" model whereby senior physicians in Ethiopia are trained by experts in the U.S. to prepare them for training others locally. Experts from Johns Hopkins University, MAYO Clinic College of Medicine, Detroit Medical Center, Kennesaw State University, and Addis Ababa University took part in the delivery of the training.

Technical complexities, cultural differences, and time zones were recognized as challenges (Negash, 2004b). The success of the program, however, exceeded expectation. Participants, trainees and trainers alike, expressed their jubilation and acknowledged the experience as the dawn of a new era to overcome the "brain drain." The two primary components of success for the case study were Communities of Practice that provided the content and videoconferencing technology that made the connection possible.

Content generation is a key part of overcoming geographic brain drain. The number of locally developed Web sites in Africa is only 0.1%. Most of the Internet activity in Africa is passive recipient of information from Web sites developed by other global users (Polikanov & Abramova, 2003). The lack of local content impedes the progress of ICT in Africa (Polikanov & Abramova, 2003). Engaging the locals, developing contextually appropriate ICT content, community needs

assessment, and grassroots research are fundamentally important for the development of ICT (Roman & Colle, 2003). "Awareness raising about the value of information and the integration of information services within the local communication structures constitutes a basic foundation for locally relevant content generation and use" (Roman & Colle, 2003).

By linking Communities of Practice in dispersed locations videoconferencing can create value (Lesser & Storck, 2001). While waiting for adequate number of African professionals to return to their homeland, a slow phenomenon at best, videoconferencing and other ICT advances may provide an immediate venue for reversing the brain drain.

The concept of Communities of Practice is growing fast (Por, 2004). Recognition of this potent venue by the Ethiopian diaspora can serve as the core strategy to leapfrog Ethiopia in economic development. The Ethiopian diaspora can strengthen Communities of Practice in all fields of development by collaborating and sharing work experience using videoconferencing and other ICT tools. The dearth of local content generation may also be bridged by forming Communities of Practice.

DEVELOPMENT CHALLENGES

There has been limited research in understanding ICT diffusion in countries with developing economies (Baliamoune-Lutz, 2003). The four primary causes for Africa's low ICT penetration are: electricity and transport, tax polices, government monopolies, and brain drain (Jensen, 2001), and Ethiopia is no exception. Most tax regimes still treat computers and peripherals as luxury items, which makes these almost exclusively imported commodities all the more expensive. The general business climate for increased investment in Africa, acutely needed for the ICT sector, has suffered limited opportunities due largely to the historic pattern of monopolies and high levels of state control (Jensen, 2001).

Additional challenges identified in Ethiopia while conducting this study include:

- **Empowerment:** Lower level management seek detail instructions before taking any action, lack of empowerment tends to hinder progress;
- **Work ethic:** Secretaries, guards, screeners, chauffeurs, and messengers create a level of redundancy that tends to substitute messengers in lieu of direct communications;
- **Techno-centric approaches vs. outcome centric approaches:** The technology has taken central

focus in lieu of civic needs, this trend should be reversed to put the focus back on the desired outcome.

The Ethiopian government can play a key role in advancing development through ICT by easing taxation, monopoly policies, and creating opportunities to encourage ICT use by the general public. For example, Senegal has the largest number of telecenteres (9,000), which enjoy the support of the national telecom (Polikanov & Abramova, 2003). For example, a number of Internet service providers (ISP) in the U.S., U.K. and Argentina, provide free access to the Internet (Polikanov & Abramova, 2003) encouraging access by the general public.

CONCLUSION

This article has presented two models: a model for ICT Assimilation and the Communities of Practice model for content delivery. The ICT Assimilation model focused on infrastructure building and how top management can gain better understanding when managing ICT projects. Lack of understanding by top management on issues of ICT development can often lead to misguided investment in infrastructure that take decades to redress and retro-engineer.

Building ICT infrastructure is a critical step, as without it, ICT development simply can not take place. However, technology development by itself does not deliver value. The benefit is realized by the services provided using the ICT infrastructure. Ethiopians and friends of Ethiopia can make a significant difference by contributing local content that promotes local development. The Communities of Practice model focused on content delivery and how the diaspora can engage in complementing in-country development by providing locally and culturally relevant content. This article presented how ICT can be used as a medium to provide professional training. Similar services in various areas of locally and culturally relevant content need to be provided to effect useful development.

Together, effective ICT infrastructure building and locally relevant content delivery are proposed as crucial for a sustainable local community development. By combining ICT infrastructure, government policies, and diaspora know-how, Ethiopia can overcome its current state of underdevelopment. While having eighty-five percent of its population living on less than US$1.00 per day is a dire situation, the future without ICT enabled locally driven sustainable development may be worse.

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KEY TERMS

Brain Drain: The emigration of highly educated workers from developing countries to developed countries.

Broadband: Transmission facility having a bandwidth sufficient to carry multiple voice, video or data channels simultaneously, often greater than 512 Mbit/sec. Each channel occupies (is modulated to) a different frequency bandwidth on the transmission medium and is demodulated to its original frequency at the receiving end.

Communities of Practice: Self-organized, deliberate collaboration of people who share common practices, interests or aims and want to advance their knowledge. When the community proves useful to its members over time, they may formalize their status by adopting a group name and a regular system of interchange.

Diaspora: A dispersion of a people from their original homeland.

ICT (Information and Communication Technologies): Information processing by electronic means, concerns telecommunication, hardware, and software. The phrase was coined by Stevenson in his 1997 report to the UK government and promoted by the new National Curriculum documents for the UK in 2000.

Very Small Aperture Terminal (VSAT): An earth-bound station used in satellite communications of data, voice and video signals, excluding broadcast television. A VSAT consists of two parts, a transceiver that is placed outdoors in direct line of sight to the satellite and a device that is placed indoors to interface with the transceiver with the end user's communications device, such as a PC.

ENDNOTES

[1]   According to Polikanov and Abramova (2003), Internet users are referred to here by the number of Internet subscribers. In African countries computer sharing is common and it is estimated that three to five users share a computer. And hence the actual number of Internet users may be significantly larger.

[2]   www.BethanyMemorial.org

[3]   http://www.enahpa-dc.com/

ICT for Social and Cultural Capital in Pacific Island Communities

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INTRODUCTION

When new technology arrives in a society, it enters an already existing order of social hierarchies, power relationships and a knowledge base. The adoption of the technology can enhance the position of individuals or groups in the social order and isolate those unable to co-opt it easily for their own benefit. It can widen class, gender and generational gaps. For example, young people are able to interact with new information and communication technologies (ICT) more easily then their parents. Women and rural dwellers, on the other hand, benefit the least from ICT diffusion through lack of access (Joshi, 1998). In developing countries, adoption is further constrained by the fact that the technologies which are introduced have been primarily developed for use in industrialised societies. The frustrations of rural communities, attempting to adapt to products which were designed for urban consumers, have been the cause of mirth as well as desperation among local users. The incompatibility of technology, human needs and lack of knowledge and infrastructure in developing countries is exemplified in the following anecdote which the writer first heard when working as a journalist for the *Fiji Times*:

A rural dweller, Jone, arrives in the city of Suva to visit his niece. In the morning, when he awakes, his niece plugs in the electric kettle to boil some water for tea. Not having seen such technology before, Jone is amazed at this "miracle". He decides to buy one and take it home for his wife. Upon his arrival in the village, Jone gathers the clan to show them his new miracle appliance. He takes the kettle out and plugs it into the wall of his thatched bure and they wait…and wait…and wait. Of course, nothing happens because Jone had missed out on one minor detail when he purchased this new technology. He needs electricity to boil his water and his village is still unconnected. Instead of enhancing his position in the clan as an early adopter, this lack of knowledge makes Jone a laughing stock of the village.

BACKGROUND

Pacific Island nations together make up a population of 8.5 million, or less than 0.01% of the world's population. The islands are among the last places on earth to receive television and Internet access. In a global environment of commercialisation and consumerism how do small nation states with insignificant populations harness ICT for their own benefit?

Governments in developing countries see the introduction and adoption of ICT such as the Internet as the new "miracle" technologies which might help their nations out of an economic quagmire and towards a prosperous information society. But the hype surrounding communications technology overshadows the end users and the impact technology has on them. "What's new *for society* about the new media?", asks Sonia Livingstone (in Flew, 2002, p. 10). In his discussion of technology and society, Castells points out: "Technology does not determine society. Nor does society script the course of technological change…the final outcome depends on a complex pattern of interaction" (2000, p. 5).

Scholars such as Herbert Schiller, Theodore Roszak and Frank Webster have emphasized the importance of differentiating information on qualitative grounds. Roszak argues that too much has been made of "quantitative measure of communicative exchanges" in the information society debate (Webster, 2002, p. 11). In his discussion of Roszak's critique of the information society, Webster points out:

His examination emphasizes the importance of qualitatively distinguishing information, extending to it what each of us does on an everyday basis when we differentiate between phenomena such as data, knowledge, experience, and wisdom (Ibid).

There is a difference between knowledge and information. While the former is situated within the realm of enlightenment and betterment of society and is transformative in nature, the latter is an accumulation of data. Indeed one person's knowledge may be another's data. Information becomes knowledge when it makes a qualita-

tive difference to the lives of those engaged in its adoption. Does this information have value for me? Is it going to change me or my community in any meaningful way? In other words, it must have a development potential resulting in an improved quality of life. To use Nepalese journalist, Kunda Dixit's words: "… To be useful, information must help people communicate, participate and allow them and their rulers to make informed choices" (2000, p. 1).

Despite being located on the fringe of the information technology boom, it is still possible for island communities to engage actively with ICT for community empowerment and participation at a local level using alternative media models to develop local content which are closer to local realities reflecting cultures, traditional values and individual aspirations.

MAIN THRUST OF THE CHAPTER

Internet in Fiji

As a developing nation, Fiji presents a challenge to most forms of media with its multiracial population and recent history of civil strife. It is politically volatile, multi-lingual with widely divergent audiences in terms of culture, age, rural-urban divide and social observance (see Table 1). Yet Fiji enjoys a vibrant media environment. There are three English language dailies, weekly newspapers in Hindi and Fijian, two business magazines, numerous commercial FM radio stations along with the two public service stations, one commercial free-to-air television and three pay television channels. The community media sector has also grown, following changes to the broadcasting legislation, with one community television station, a women's radio frequency and several Christian-based radio stations broadcasting in various parts of Fiji. As a new communications network, the Internet has held a low profile in this communication milieu for a number of reasons as will be discussed.

As a decentralised communication network, the Internet holds great promise for a diverse population. It can facilitate the preservation and sharing of indigenous

Table 1. Fiji: A demographic profile (Source: Fiji Islands Statistics Bureau)

Population:	840,000 (2002 est.)
Ethnic Groups:	51% Fijians
	44% Indians
	5% Europeans, Rotumans and others.
Median Age:	23.7 years
Literacy:	94% (15yrs and over who can read and write)
Languages:	English (official), Fijian and Hindi
Urbanisation:	49%

knowledge, provide an essential network for information and communication exchange amongst the community sector and government agencies, and enable learning and skill- building for the growing youth population.

Internet use in Fiji has been growing steadily in recent years in the commercial and government sectors, but has made little inroad in the domestic market. The first use of Internet in Fiji was at the University of the South Pacific (USP) in the late 1980s when it was used for intranet connection. As a result, the domain name .fj, registered in 1995, is held by USP, which is responsible for registering all second level domains in Fiji (Minges & Gray, 2004). The first Internet Service Provider (ISP) was set up by the domestic carrier Telecom Fiji. Internet usage is mainly limited to Government and business sectors which were among the first to sign up as customers. Very few homes, even in the urban areas, have Internet connections. The costs of computers and of ISP connections are beyond the means of many people. One positive area of growth has been the Internet cafes which enjoy vigorous business from the youth population. From the author's observation, in urban centres such as Suva and Nadi, more than 70% of Internet users are young adults and school students who use it for emails, chat lines and to research school projects. Fiji's Internet penetration is 2.7% or 22,000 connections, mainly in the workplace (ITU, 2003). This represents a growth of 193% compared to the 2000 figure of 8,000. The ISP, Connect, estimates that there are 50,000 users in Fiji raising penetration to 6.1%(Minges & Gray, 2004).

Fiji enjoys a well-developed infrastructure compared to its regional neighbours.

62% of homes in Fiji are connected to electricity. Remote island communities use generators for power. Just over one third of Fiji's households are connected with fixed telephone lines. The mobile phone penetration rate is 11. 4%, 90% of which are pre-paid customers, based predominantly in urban areas (Ibid).

Impediments

Major impediments to Internet development in Fiji have been unequal telecommunications access between urban and rural population, prohibitive costs, existence of monopolies and lack of awareness and knowledge of the Internet.

For many, the price of Internet connections is prohibitive, with the cost of connection in 2004 starting at around $F34 for 15 hours of access per month and $F5.00 for each additional hour (Connect Internet Services, 2004). Compare this with the average annual income of around $F3500 ($F290 per month). With the post-coup economic woes and business closures many wage earners are paid far less than the average weekly rates. Users

predominantly access the Internet for email communication. Slow connections, disconnections and slow download speeds mean that emails take time to retrieve. Time is money in this context.

Pricing is directly related to the telecommunications monopoly held by Telecom Fiji Ltd (TFL) until 2014. Its parent company, Amalgamated Telecom Holdings (ATH), has the following structure: TFL is the domestic carrier and FINTEL, for which ATH has management rights over the government's 51% shareholding, is the international carrier. Vodaphone Fiji Ltd, the mobile phone company and Connect, the ISP, are subsidiaries of TFL (ATH, 2002:14). Eight ISP licences have been issued, but have not been activated. In any case, these would not represent competition as they would rely on Telecom Fiji's infrastructure and pricing regime.

The Government is currently reviewing the regulatory framework in various areas. In the 2003 Budget statement, the Government identified telecommunications pricing as an area needing reform along with developing a suitable regulatory framework, addressing the inequity in telecommunications access and the high degree of ICT illiteracy (Fiji Budget, 2003:11). Policy makers are aware that computer illiteracy and limited knowledge about the Internet will hinder connectivity (Turaganivalu, 2003). People not only lack the skill to use the technology, but lack an understanding of how it can enrich and enhance the broader community and assist in development.

The community sector has also suffered from a lack of access to technology. In an informal stock-take of its membership, the National Council of Women (NCW) in Fiji found that many of its members "lack the basic tools for efficient project administration, communication and information dissemination, i.e., a computer, a phone or fax machine, let alone Internet connection" (Rolls, 2000, p. 13). The NCW is a co-ordinating body for a diverse range of women's groups, clubs and national organisations.

The national secretary, Sharon Bhagwan Rolls, encouraged donors to provide the appropriate technological tools to organisations for the long term to achieve better communication and gender balance in ICT access:

Just as women are being encouraged to pick up a video camera or audio recording equipment to document and produce her-stories, so women need to be encouraged to acquire the knowledge and skills, especially in relation to accessing and using computers and the Internet, in order to effectively participate in global advocacy, lobbying and communication networks. This is one way to ensure the women's viewpoints are shared across and throughout all the regions of the globe (Ibid).

Milestones

In 2000, Fiji was connected to the Southern Cross Cable Network (SCCN) allowing Fiji's International carrier, FINTEL, to offer broadband service for the first time. The undersea fibre optic cable connects Australia and New Zealand to the US mainland transiting in Fiji and Hawaii, thus bringing Fiji into the global information infrastructure. Besides its potential to make Fiji the information hub for the South Pacific region, it will also attract commercial investors in the area of IT service, such as call centres and data processing zones, to Fiji (Purcell & Toland, 2003). The Fiji government, in partnership with FINTEL, has mounted an ambitious project at a cost of US$450 million to link 10 countries in the South Pacific with fibre-optic cable which will come back into Suva to join the SCCN. Chief Executive of FINTEL, Phillip Richards, believes this will give the South Pacific countries increased capacity on global applications such as tele-services, tele-medicine and tele-education. The services will be complemented by the nations' satellite networks which will also be used for domestic distribution (WINNE Online, 2003). In 2005, the broadband available on USP Suva campus increased from 1 Mbps to 155 Mbps, enabling a new link with the Australian Academic Research Network, AARNET.

The Government has indicated that it is formulating a comprehensive national ICT development policy, in light of the opportunities provided by SCC, towards "bridging the digital divide" and optimising Fiji's place as "the hub for information and communication transmission" (Fiji Budget, 2003, p. 11). The question is can this new network accommodate alternative uses of new media encouraging civil society participation or will it be largely market-driven in the service of the global economy? For the benefits to trickle down to the people in rural areas where it is most needed, the government will have to formulate policies and support rural-based projects which would enable ICT adoption by those who can least afford it.

FUTURE TRENDS

The Internet Coup

The second milestone for Internet development in Fiji also occurred in the year 2000. The civilian coup d'etat on 19 May 2000 brought world-wide attention to a small Web publisher, Fijilive.com, which provided the only communication link out of Suva during the critical first 48 hours of this crisis. In their attempt to paralyse

communication with the rest of the world, the perpetrators had cut the international telephone lines but some Internet lines had remained operational. The Fijilive publisher, Yashwant Gaunder, a journalist by profession, instantly recognised the power of the Internet in maintaining the global communication flow. In an amazing example of reverse news flow, the world's news media took direct feeds off Fijilive.com to inform international audiences about the events unravelling in Fiji's Parliamentary compounds, thus describing it as "the Internet coup". Gaunder himself was surprised by the interest his Web site generated worldwide. He recollects the events of 19 May 2000 and how his Web site became the central channel of information flow out of Fiji:

We were not sure if the people could read the information. At night we started receiving calls from all over the world, people wanting to talk to us, and then we realized that people were surfing or reading Fijilive.com and keeping up-to-date with the news. But it was only around midnight that it really hit home to us what was happening. This is the time when BBC World News comes on and the first story on BBC World TV was the coup in Fiji and staring at us from the television screen was our Website. Straight after that it was a nightmare. We were getting calls from all over the world—from Trinidad, from South Africa— people wanted to interview us and find out what was happening. (Gaunder, 2003)

By this time, the small Web site had received more than 100,000 hits. Hosted in the US with a limited capacity, the server crashed as soon as it increased to 120,000 hits. The site was re-hosted within 24 hours and its new address was quickly circulated amongst the online community hungry for the latest political development. Former Fiji residents made up the largest number of loyal visitors to the site followed by local Internet users, and a range of individuals, governments and organizations with an interest in Fiji. Fijilive.com now receives up to 10 million hits per month and charges a subscription for the use of its comprehensive archives. Other online news sites included Fijivillage.com and Pacific Journalism Online, USP's journalism training Web site, which provided critical analysis of the coup lacking in other media outlets (Robie, 2000). Unfortunately, the major beneficiaries of the online news sites are not the people of Fiji but those living overseas including expatriate Fijians.

Communities worldwide are employing new forms of ICT for a variety of activities to promote social, political and cultural capital. In his examination of Internet activism, Meikle (2002) has explored how communities, locally and globally, have used the Internet during times of crisis to effect change. This use of the Internet occurred amongst Fijian communities during the coup in May 2000.

Online Community

At the time of the coup there were about 100,000 former Fiji residents living in a number of the world's metropolitan centres. Numerous Web sites sprang up representing diverse views and articulating the concerns of ex-Fiji residents in Canada, the United States, Australia, New Zealand and the UK, creating a transnational diasporic public sphere (Appadurai, 1996). The Indo-Fijian Diaspora found a new identity online as a vocal, politically engaged, borderless community. Computer-mediated communication in the form of emails, Internet chat rooms and forum postings became central to facilitating a virtual community for dispersed Indo-Fijians who struggled to make sense of yet another coup. During the 1987 coup the Indo-Fijian Diaspora relied on community media and social or religious groups to inform and organise political resistance. The May 2000 coup heralded a new form of engagement for a marginalised community which had experienced political exclusion once too often. Large amounts of information flowed—some profoundly insightful, some informative, some full of angst—to create a global support network. Academics in Canberra and Suva, lawyers in Melbourne and London, whole families in suburbs of Sydney, Vancouver and Los Angeles used the World Wide Web for collective action to voice their concerns, petition their political representatives and seek justice on behalf of their countrymen in Fiji. Indigenous Fijian voices also brought unique insights on issues of nationalism, provincial loyalties and chiefly ambitions. The Internet activity was largely uncoordinated and in the aftermath of the coup many of these Web sites have disappeared. But during the coup the World Wide Web presented Fiji's dispersed diaspora communities with an invaluable channel of communication and a virtual community shelter in a time of crisis and extreme anxiety.

CONCLUSION

There is no doubt that online communication and engagement can now be extended in post-coup Fiji for the purpose of reconciliation. As a democratising force, the Internet can be used by a socially fragmented community in rebuilding its identity through projects of social rehabilitation and healing. For this to happen, local communities have to be encouraged to participate in meaningful local content production as an extension of other reconciliation projects. To represent success-

fully their needs and aspirations on the Internet, local communities must engage in local content development in a self-directed and culturally appropriate context. Ultimately what gets produced must come from the hearts and minds of the communities themselves.

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KEY TERMS

Diaspora: Immigrant communities which live in nation-states other than their original homelands.

Fibre-Optic Cable: Composed of one or more optical fibers, a fibre-optic cable transmits data as a lightwave over long distances at a high speed.

Local Online Content: Content developed for the World Wide Web by local communities reflecting their intrinsic values, traditions and needs.

Tele-Education: Teacher support and educational resources supplied mainly through computers using one-way or two-way communication for distance education program from K-12, universities or adult learning.

Tele-Medicine: The provision of clinical advice by health care professionals to patients living in remote rural areas. Technology used in telemedicine can range from telephones to more sophisticated applications that employ advanced image as well as audio capabilities e.g., x-rays or teleconferencing.

Virtual Community: People engaged in public discussions through computer-mediated communication using text-based Internet tools.

Wireless Technologies: New forms of portable devices such as mobile phones and laptop computers which allow users to communicate using radio signals, microwave and satellite links.

ICT in Medical Education in Trinidad and Tobago

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INTRODUCTION AND BACKGROUND

Information and communication technology (ICT) allows users to access information without taking geographic position into account. These users are also unconstrained by time, volume, or format of the information. ICT applications have enormous potential as a tool for aiding development in countries such as Trinidad and Tobago. Telemedicine, which can provide medical services to persons in isolated places, in emergencies, to the homebound, or the physically challenged, is but one example. Mansell and Wehn de Montalvo (1998) noted that "ICT applications facilitate telemedicine" (p. 85), and that "economic development can be fostered by tele-working and tele-services in some developing countries" (p. 83).

The twin-island nation of Trinidad and Tobago lies at the southern end of the Caribbean chain of islands, approximately seven miles off the northeast coast of Venezuela. The area covers 1,864 square miles (5,128 sq. km.), with a population of approximately 1.5 million. The economy of this small nation state is based mainly on petroleum and gas-based industries, but there is a growing service sector. PAHO figures (2002a, b) show a highly literate population with an overall adult literacy rate of 98.5% (males at 99.1% and females at 97.9%).

Transshipment and telecommunications facilities contribute to this country's position as the most industrialized in the Caribbean. The country's technical capacity and access to information have grown enormously in recent years. Telecommunication tools extend to the vast majority of the population. Per capita GDP stands at US$8,500.

There is a shortage of medical staff in general, with the ratio of doctors to inhabitants at 7.5 per 10,000. Shortages in primary health care are more acute than in other areas and have resulted in the employment of retired nurses and the recruitment of professional staff from other countries, particularly from Nigeria, India, and more recently, from Cuba. Trinidad and Tobago therefore stands poised to benefit from further development by fully embracing ICT, especially in the areas of education and medicine.

MEDICAL EDUCATION IN TRINIDAD AND TOBAGO

Medical education in Trinidad and Tobago engenders self-directed, lifelong learning through the use of the problem-based learning (PBL) method of teaching. The Faculty of Medical Sciences (FMS) of the University of the West Indies opened in St. Augustine, Trinidad and Tobago, in 1989, and has utilized PBL from its inception. Students' relative independence has been noted (Donner & Bickley, 1993) in students following PBL programs. Donner and Bickley noted that "they differ markedly from those following traditional medical programmes… [becoming] more skilled at an eclectic style of learning" (p. 297). These students show particular personal characteristics that encourage them to take a proactive role in their own learning, making them lifelong learners.

Research has also shown that PBL students make maximum use of library resources and that librarians taught the use of technology as a means of accessing, organizing, and managing information (Marshall, 1993). Library instruction is therefore a required part of the curriculum. Librarians become not just providers of books and other materials but also instructors in the use of modern technology. The library, therefore, prepares medical students for wider use of other applications and technologies to support their future information needs. This has implications for how these students will operate when faced with adverse conditions such as rural health offices and hospitals with limited resources, and for development in the community generally; these students in their homes, in their practices, and in the wider community will generate a multiplier effect.

INSTRUCTIONS IN THE USE OF MODERN TECHNOLOGIES IN THE MSL

From its inception, the Medical Sciences Library (MSL) has embarked on a program of information literacy for

undergraduates and other categories of users. From as early as 1993, topics such as "MEDLINE: basic and advanced"; "International Pharmaceutical Abstracts (IPA)"; "MedCarib—health literature for the Caribbean"; "ProCite"; "Introduction to Computers"; and later, "EPI Info"; "Introduction to the Internet" and "PubMed" have been taught. In facilitating this training, the library equips its clientele with survival skills for the 21st century.

The Trinidad and Tobago Ministry of Health also recognized a need for retraining, because new demands were being placed on practitioners by health care transition, health care reforms, increased public and patient expectations, and advances in medical sciences and technology. The Ministry found that medical practitioners required additional skills. This was part of the rationale for the introduction in 2000 of a new postgraduate diploma in Primary Care and Family Medicine being offered by dual mode, face-to face initially, and thereafter, through distance education.

The library component of this course focused on skills such as "Locating and evaluating health information"; "Skills base for managing health information resources"; "Innovations in health information practice"; "Effective search and retrieval principles"; "MEDLINE on the Internet"; "Finding biomedical information on the Internet"; "Evaluating information resources"; and "Managing bibliographic references". Assessment tasks included:

- Joining and leaving an electronic discussion group
- Subscribing and unsubscribing to a mailing list
- Posting to a discussion group
- Locating an electronic serial and printing an article or abstract
- Executing a search on MEDLINE or PubMed and printing the results
- Creating a small database and generating a bibliography

Each session represented distinct skills requirements and supported the utilization of applications to manage the efficient exchange of information among health professionals.

ICT IN EDUCATION: PRIMARY, SECONDARY, AND TERTIARY

Primary and secondary schools in Trinidad and Tobago are also embracing the technology. Many secondary schools have computer science as a subject on the curriculum and typically have computer laboratories. More than 35% of the 78 primary and 120 secondary schools

listed in the telephone directory for 2003–2004 have computers with Internet access facilitated by Telecommunication Services of Trinidad and Tobago (TSTT), the only telephone company on the twin islands. Additionally, there are 22 Internet cafes listed in the yellow pages of this directory. Some of these Internet cafes are located in rural areas such as Enterprise, in Central Trinidad, and Penal in the south of the island. Eighteen Internet Service Providers are listed as well.

Other initiatives to produce a computer literate society in Trinidad and Tobago include the government making computer loans available to all public servants. In 2002, the government also launched an initiative, the National Information and Communications Technology Plan (2004), that aims "to connect people, communities, business, government and educational institutions through an integrated technology network. It will also examine the policy, financial and skills development requirements that will be necessary to ensure sustainability and to ensure that the benefits of connectivity continue to grow, and accelerate, as new technologies, innovation and thinking emerge."

A survey (NIHERST, 2002) designed to provide empirical data on the penetration of ICT in private households reflects the varying penetration of ICT in private homes of varying socioeconomic status. Data were collected from a representative sample of 2,812 households throughout Trinidad and Tobago. Thirteen percent (13%) of the households in Trinidad and Tobago (approximately 44,600 households based on national statistics for 2000) had a home computer as of June 2001. By comparison, more than 30% of the households in a number of Organisation for Economic Co-operation and Development (OECD) countries were equipped with computers in 1997, and more than half (54%) of the households in Australia had computers in May 2000. Other important findings of the survey were that affordability was the major constraint in 56% of all households without computers; ranging from 43.9% in the City of Port of Spain to 78% in the Borough of Point Fortin. Also, 53% of households purchased computers from private savings; 13% accessed government loans. Households (20%) with gross monthly incomes of $6,000–$7,999 had the largest proportion of home computers, followed by 15% of households with incomes of $4,000–$5,999. Only 5% of households with monthly incomes of less than $2,000 had computers. In 2000, 27% of the computers were acquired compared with 6.7% in 1997. Almost three out of four persons (73%) in each household used the computer. The proportion of male (51%) to female (49%) computer users was generally similar. Approximately 16.6% of computer users were between 15 and 19 years of age, 16.3% between 30 and 39 years and 14.5% between 40 and 49 years. Of computer

users, 50% had acquired secondary level education, and only 3.8% had a university level education in computer studies. Approximately 50% of computer users were employed and self-employed, and 39% were students. In private enterprises, 59.8% of employees used the computer compared with 29.7% in government. Windows 98 and 95 were the main operating systems in 74.4% of households. Most households (70.8%) used the computer daily between two and five or more hours. Only 11.8% of households were engaged in software development, and 20.2% accessed distance learning/education compared with other activities such as games (78.4%), Microsoft Office (66%), e-mail (62.4%), and Web searches (61.5%).

Apart from the Faculty of Medical Sciences, the university as a whole is also involved in programs to implement ICT applications. The UWI, St. Augustine, in its latest strategic plan (2003–2007) identified student-centeredness as one of its strategic objectives. The campus libraries, of which the MSL is a branch, determined that promoting the use of ICT in delivery of service and products was one way of meeting this objective. Additionally, an increasingly complex print and digital environment was emerging, and people began to expect certain services without coming to the library. Facilitated by the technology, the libraries were able to accomplish one of their main missions by launching a valuable new campus-wide online course, "Foundations of Information Literacy" on March 2, 2004. It is a modular course covering the following seven topics:

1. Basic computer literacy
2. Basic research skills
3. Using the OPAC (online public access catalogue)
4. The Internet as a research tool
5. West Indiana and Special Collections
6. Online databases
7. Managing references

There were tutorials on how to use each of the databases to which the libraries subscribe, as well as a quiz and online feedback, discussion board, and on-campus WebCT server.

In its quest to keep abreast of technology, the St. Augustine campus libraries is looking at further ways to implement applications in ICT in its ongoing program of work. Initiatives such as a digital reference service are also being considered. This project aims to answer students' reference queries in real time and will enable persons needing live human assistance while using the Web to immediately get the help they need from librarians who can quickly provide the answers. Speed and responsiveness are critical to this initiative, which will radically change the way we serve and support our clientele.

A TOOL FOR COMMUNITY DEVELOPMENT

Based on our epidemiological circumstances, where the Caribbean is second only to Southern Africa in the proliferation of HIV/AIDS and other STDs, ICT can indeed be seen as an effective tool for development. The toll of HIV/AIDS is heaviest on young persons between the ages of 18 and 45, who form the majority of the workforce. CAREC figures indicate that in Trinidad and Tobago, 5,000 persons have died of AIDS since 1985. The nature of the response to these diseases has to do with preventive education, capacity building, and treatment, care, and support.

ICT can play a role in the way people connect with information. Through ICT, people in remote areas can have access to the same information as many of the people in developed countries. With an infusion of ICT learning, people in underdeveloped countries such as Trinidad and Tobago can access and share critical health information that can help in the fight against HIV and AIDS, and its related morbidity and mortality. Ideally, health education should begin in primary schools. When this occurs, the transformative nature of ICT on the epidemiological status of affected countries can become visible.

CONCLUSION

The type of medical education available in Trinidad and Tobago, the campus libraries' program of instruction in the use of ICT, the government's initiatives to make computers available to public servants, the provision of computers in primary and secondary schools, the burgeoning economy, and the developing infrastructure all signal that this country is capable of embracing fully ICT applications that can enhance community development. Additionally, the postgraduate course has been viewed as an investment in the health care of Trinidad and Tobago nationals, in terms of an enhanced quality of health care that will be rendered by the practitioners involved. Healthy individuals contribute to a more productive economy. The course is ongoing, therefore, there will need to be an increment to those receiving training, as well as those receiving enhanced care. Three further cycles of the postgraduate course have been held, resulting in at least 60 primary care physicians who have already been exposed to and benefited from the postgraduate training provided by the MSL.

By teaching the core competencies of information literacy, identifying the information needs, accessing

information, and understanding the legal and other issues in the use of information, the St. Augustine campus libraries aim first to increase the competitiveness of the student. However, not only have the libraries supported the academic enterprise, but they have also made available resources for knowledge creation and capacity building. At the Medical Sciences Library, we assisted in the retraining of primary care physicians to make them comfortable with the new technologies. This has resulted in more effective, efficient high-quality health care for the national community and has contributed to development.

Today's information consumer wants seamless access whenever and wherever they want it. They are comfortable with Web-based information. In this complex and rapidly changing, increasingly interconnected environment, ICT can be an effective tool for community development.

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KEY TERMS

Digital Reference Service: A human-mediated, Internet-based service in which users' queries are answered in real time.

Discussion Group: Any system that supports group messaging, e.g., a shared mailbox, Usenet, bulletin board system, or possibly a mailing list, used to publish messages on some particular topic (FOLDOC, 2004).

Information Communications Technology (ICT): The study of the technology used to handle information and aid communication. The phrase was coined by Stevenson in his 1997 report to the UK government and promoted by the new National Curriculum documents for the UK in 2000 (FOLDOC, 2004).

Listserv: An automatic mailing list server, initially written to run under IBM's VM operating system by Eric Thomas. Listserv is a user name on some computers on BITNET/EARN which processes e-mail requests for addition to or deletion from mailing lists. Examples are listserv@ucsd.edu, listserver@nysernet.org. Some listservs provide other facilities such as retrieving files from archives and searching databases. Full details of available services can usually be obtained by sending a message with the word HELP in the subject and body to the listserv address. Eric Thomas has recently formed an international corporation, L-Soft, and has ported Listserv to a number of other platforms including Unix. Listserv has simultaneously been enhanced to use both the Internet and BITNET. Two other major mailing list processors, both of which run under Unix, are Majordomo, a freeware system, and Listproc, currently owned and developed by BITNET (FOLDOC, 2004).

MedCarib: A database of the health literature of the Caribbean.

MEDLINE: A CD-ROM database of medical literature in journals produced by the National Library of Medicine, United States.

Problem-Based Learning (PBL): A concept in which students focus from the beginning of their course on a series of real professional issues, where the knowledge of the various academic disciplines that relate to these issues is integrated.

PubMed: An online database of over 14 million citations of biomedical articles from 1950 to the present time. This database is available free over the Internet.

WebCT: Software that provides electronic learning in a flexible integrated environment.

ICT in Regional Development

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INTRODUCTION

Economic development and information and communication technology (ICT) are found to move together in the present day era of globalization. ICT can contribute significantly in economic development of a region by providing adequate information at the minimum of time and cost, thereby enhancing productivity in different sectors of an economy. This fact is substantiated by several studies (Kraemer & Dedrick, 2001; Pohjola, 2001). Some country specific studies like that of Singapore (Wong, 2001) also highlighted similar results. ICT diffusion in the world has been quite rapid since the mid 1990s. While the developed countries have benefited substantially from the ICT growth, the developing countries could not reap similar benefits out of it which has resulted in emergence of a digital divide across the countries (Economist, 2000; Nkrumah, 2000; Norris, 2001). This divide is noticed not only across countries but also within a country and this is more prominent in developing economies like India. ICT diffusion is another area which needs more attention in India as it will lead to ICT access and application of ICT in real sectors to increase productivity and output. During the past one decade India has made rapid ad-

Table 1. Internet growth in India (Source: Adopted from Globalization, Inequality and the internet in India by Elizabeth C. Hansen [http://www.isanet.org/archive/hanson.html])

Date	Number of Internet Connections	Number of Internet Users
1	2	3
August 15, 1995	2,000	10,000
March 31, 1996	50,000	250,000
March 31, 1997	90,000	450,000
March 31, 1998	140,000	700,000
March 31, 1999	280,000	1,400,000
March 31, 2000	900,000	2,800,000
August 31, 2000	1,600,000	4,800,000
January, 2001	1,800,000	5,500,000

Table 2. Internet growth and usage in selected Asian countries (Source: www.internetworldstats.com)

Countries	Internet users (2000)	Internet users (2004)	Use growth (%) (2000-04)	% population penetration
1	2	3	4	5
China	22,500,000	79,500,000	253.3	6.0
India	5,000,000	18,481,000	269.6	1.7
Japan	47,080,000	64,537,437	37.1	50.4
South Korea	19,040,000	29,220,000	53.5	62.0
Malaysia	3,700,000	8,692,100	134.9	35.3
Pakistan	133,900	1,500,000	1,020.2	1.0
Singapore	1,200,000	2,100,000	75.0	60.0
Sri Lanka	121,500	200,000	64.6	1.0
Taiwan	6,260,000	11,602,523	85.3	50.3
Thailand	2,300,000	6,031,300	162.2	9.4
Vietnam	200,000	3,500,000	1,650.0	4.2

vances in ICT growth as reflected in the increase in the number of Internet connections and users. The growth of Internet connections and users in the country is shown in Table 1.

Thus, Internet growth in India during the second half of 1990s has been phenomenal. However, the country is lagging behind other countries in ICT diffusion. The comparative position of India with some selected Asian countries in terms of Internet growth and usage is shown in Table 2.

The table clearly indicates that there is appreciable growth in Internet use in India over the period 2000-2004, but the penetration is abysmally low at 1.7% of the population whereas in China it is 6.0%. Some other small Asian countries like Japan, South Korea, Singapore, Taiwan have made substantial progress in terms of penetration which is evident from the table. Digital divide is glaringly obvious across different regions of the country. For example, while many states in Western and Southern region of India have witnessed rapid ICT growth and diffusion, states in regions like East and North East are found to lag behind. Out of 28 states and six union territories in India, only five states namely, Karnataka, Delhi, Tamil Nadu, Andhra Pradesh and Maharastra accounted for 1.4 million Internet connections out of a total of 1.5 million connections in the country in 2000

(Prabhakaran, 2003). Increasing participation of non-governmental organizations (NGO) and private sector is important for bridging the digital divide. Efforts are already going on to achieve this objective by involving private sector companies in many parts of the country[1]. However, infrastructural bottlenecks in the backward regions of the country are found to be a major obstacle in effective participation of the private sector in providing benefits of ICT diffusion to different sections of the society. Hence, the government sector has a crucial role to play in this area. In view of this, the Government of India has initiated efforts to provide the benefits of the ICT revolution to the rural masses through disseminating information and to enhance productive capacity of the rural sector. In line with the stated objectives of ICT diffusion, the Community Information Centres (CICs) Project was conceived and implemented by the Ministry of Communications and Information Technology, Government of India in the North Eastern Region of the country. In terms of providing benefits of ICT, CICs is the first initiative by the government to provide ICT access to the people living in remote areas. Such an initiative may have an impact on the socio-economic development of the region and bring the region closer to the national mainstream.

North Eastern Region of India consists of the eight states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura with a total population of 39,125,582 in 2001 (Government of India, 2002). The CICs project was launched with a pilot project covering 30 blocks in the region including 15 in Assam and was inaugurated in August 2000. By August 2002, CICs were established in all the blocks in the region, including 219 CICs in Assam covering all the 23 districts. These CICs were expected to help the region avail the benefits of global connectivity through the Internet as well as other local benefits.

A year after the establishment of CICs in North Eastern India, including Assam, it was felt necessary to assess the functioning of the CICs in Assam and its role on regional economic development. It was also necessary at this point to find out the expectations of the rural people from these centers. Keeping these twin objectives in mind, the present study was undertaken to examine the achievements of the CICs in Assam taking into account the aspirations of the rural people of the state. An attempt was also made to record the expectations of the users from the CICs in terms of information dissemination and its catalytic role in increasing productivity in the rural sector. This type of study offered promise to provide valuable guidelines to the government and as a result provide different services to the society through diffusion of ICT. It also provided the opportunity for the users to communicate their requirements/local content to the service providers. Such studies also bring out information on the stages of ICT infrastructure and acceptance of ICT as a tool of development by the users which may act as a guide to the private sector, NGOs, etc. in the process of ICT diffusion.

The following were the specific objectives of the study:

- To examine the functioning of CICs in relation to their stated objectives.
- To find out the socio-economic aspirations of the people at the block level and how CICs could help fulfill their expectations.
- To put forward recommendations for better functioning of the CICs in order to generate ICT awareness among rural people, to narrow the digital divide and achieve regional development.

CICS IN ASSAM AS A TOOL TO BRIDGE THE DIGITAL DIVIDE

Assam is the gateway to the North Eastern region of India. Because of its prominence in economic activities, contribution of a larger share to the national income and a larger population in the region it was felt to provide a good base for a sample case in relation to ICT diffusion and impact of ICT in regional development.
The case was considered to be reflective to the region as a whole. CICs in the state were set up in order to establish ICT infrastructure, to create ICT awareness amongst the local populace, to provide computer education and training, to provide government to community (G2C) services and to use ICT for sustainable regional development.

To achieve these objectives, each CICs was well equipped with infrastructure including one server machine, five client systems, VSAT, Laser Printer, Dot Matrix Printer, Modem, LAN, TV, Web cam, UPS, generator, telephone, air conditioner etc. The project was jointly implemented by Department of Information Technology under the Ministry of Communications and Information Technology, National Informatics Centre (NIC) and state governments.

The present study was based on primary data, which were collected through field work with the help of structured questionnaires. For collection of data, a procedure of multi-stage sampling was adopted.

In the first stage, nine out of 23 districts belonging to different climatic, geographical conditions and socio-economic groups of people were selected. The districts selected for the study were Kamrup, Nagaon, Jorhat, Dibrugarh, Lakhimpur, Sonitpur, Goalpara, Bongaigaon and Cachar.

In the second stage, two CICs from each of the districts were chosen keeping in mind the intra-district variations in socio-economic conditions. The CICs covered

under the study were: Rani and Kamalpur from Kamrup; Raha and Kaliabor from Nagaon; Dhekergorah and Titabor from Jorhat; Khowang and Barbaruah from Dibrugarh; Lakhimpur and Bihpuria from Lakhimpur; Dhekiajuli and Biswanath Chariali from Sonitpur; Balijana and Rongjuli from Goalpara; Dangtol and Borobazar from Bongaigaon and Borjalenga and Silchar from Cachar.

This was followed by selection of five villages from each CICss using simple random sampling procedure. Finally, about 10% of the beneficiaries were selected at random from each of these villages. Thus, total number of samples for the present study was 900. This included both users and non-users of the facilities provided by the CICs. Effort was made to include at least 75% users among the beneficiaries.

Further information were collected from the CICs operators of the CICs used in the samples with the help of structured questionnaires to elicit their opinions about the functioning of the CICs.

The data thus collected were tabulated and analysed using appropriate statistical tools.

SUMMARY OF THE FINDINGS

Some of the findings from the study are summarized below.

Participation of women in accessing information through CICs was very low. Only about 9% of users were found to be women, which clearly shows that gender participation of the sample was skewed towards male.

Students were found to be the dominant group among the users. While about 67% of the users were students, farmers and housewives constituted only 6% and 1.2% of the sample respectively. Again, about 85.11% of the sample, which comprises mostly the youth, were found to be aware about the CICs. Awareness about the facilities provided by CICs among the farming community, businessmen and other sections of the society was not spreading in desired manner. However, about 76.4% of the users were found to use the services provided by the CICs.

Some of the services provided by the CICs in Assam are:

- Training on computer application and advanced training in computers
- Word processing and printing
- Internet browsing and e-mail
- Examination results
- Health/Medical information
- Information on career opportunities
- Information on government schemes
- Information on banks' schemes

- Information on Public Distribution System (PDS)
- Downloading of application form for different government certificates
- Agricultural commodity prices
- Entertainment facility

Of all these services provided by CICs, the computer training programme was the most used (72 .40%) by the users.

Providing G2C services was one of the prime objectives of establishing the CICs in the state. However, the spread of G2C services through the CICs was not very impressive. Only about 33% of the beneficiaries were found to avail themselves of these services. The G2C services currently provided by the CICs were limited to providing information only. However, some of the information provided was found to be not current and not relevant to the rural people. Moreover, the rural people were not getting further benefits, such as getting birth certificates, death certificates, records of rights etc. at the village as was initially intended by establishing the CICs.

Among the users of other services, 49.39% were accessing information on employment opportunities followed by information on banks' schemes (37.29%) and downloading of various application forms (13.32%). The severity of unemployment problem in the state especially among the educated youth was reflected in the type of information sought by the users. In addition to these, the entertainment facility was also used by the participants in the CICs. It was found that about 51% of the sample were using the entertainment facility which was provided mostly through television broadcasting.

All the users were found to pay a user fee for various services used by them. Variation in user fee was observed depending on the type of facility used.

Location of the CICs was found to be an important parameter in accessing the services of CICs. About 82.70% of the users were found to reside within 5 kilometers from CICs. 33.28% of the users resided within 2 kilometers of the CICs. Only 0.73% of the users were found to travel a distance of more than 10 kilometres. This reflects an inverse relationship between distance from residence and the number of users.

About 36% of the users reported facing difficulties in accessing the facilities of the CICs. Most of these problems were related to the infrastructure of the CICs. Irregular supply of electricity, lack of sufficient space and furniture, non-availability of sufficient computers, delay in providing maintenance services, etc. were found to be the hindrances in exploiting the facilities of CICs. However, all the users found the services provided by the CICs in the present form useful.

Some of the specific expectations of the beneficiaries about the services that should be provided by CICs are as follows:

- Distance education
- Information on banks' schemes
- List of beneficiaries of government schemes
- Information on career opportunities
- Redressing Public grievances online
- Information on government holidays
- Land patta and records of rights
- Matrimonial issues
- Tender notice
- Government certificates
- Information on agricultural commodity prices in neighbouring markets
- Information on health and medical services
- Information on Public Distribution System
- Downloading of application forms

Some of these expected services are being currently provided by some of the CICs in Assam, but in a low key.

SUGGESTIONS

The following suggestions are offered as easy ways of improving the effectiveness of CICs in the state.

Generating awareness among the rural people about the services that can be provided by the CICs needs to be taken up rigorously. At present, awareness about the services provided by CICs is found to be mostly among the educated youth. It should be extended to the rural masses in order to achieve the objectives for which CICs were established. Emphasis should be given to make females more aware about the services provided by the CICs. This is required as women can play an active role in enhancing productivity in rural sector.

The limited spread of G2C services is mainly because of non-computerization of information and data at the district level, poor connectivity as well as lack of initiative from the state government. Initiative on the part of state government is necessary to make the CICs more vibrant and useful.

Some interactive services like online public grievances, providing records of rights of land, issuing of different certificates, residence certificates, caste certificates, birth and death certificates etc. will be taken up immediately in coordination with district administration. These types of services should be able to attract more rural people to use the services of CICs.

Efforts should be made to provide innovative services that cater for specific needs of the people. As for example, farmers could be provided with information on latest technology and specific problems such as raising alternative crops in the event of natural calamities like flood, etc. and agricultural experts may be involved online to provide advice. This has to be done within an acceptable time frame. These types of services may also be extended to school children, youth and other sections of the rural people.

Updated and relevant information should be provided by the CICs. As for example, in case of agricultural commodity prices, the figures may be updated at least weekly and the prices should be relevant to the area that a CICs serves.

Distance education programmes can be popularized through the CICs. Different universities and educational institutions providing specialized courses should be involved in this endeavour. Such programmes may be region specific and rural need based.

In order to bring transparency in government functioning, additional services may be brought under the purview of CICs. As for example, official information could be posted at different health centres in the villages and official information on rural development etc. should also be made available.

The location of the CICs needs to be reviewed. Presently, most of the CICs are found to be located either in block development offices or schools. It was observed that some of the CICs located at block development offices were too far away from the centres of the villages they serve. This affects the use and the popularity of the CICs.

In order to make the CICs sustainable in the long run, it is necessary to provide their services effectively and efficiently. The role of CICs operators in this respect is most important. They have to keep abreast of the village environment and the requirements and expectations of the rural people under changing circumstances.

CONCLUSION

Establishment of CICs was an innovative step by the Government of India to minimize the digital divide. It has been found that CICs in Assam are providing various services to rural people in a limited way both in terms of providing relevant information and G2C services. The CICs have been able to achieve some of the stated objectives such as providing ICT infrastructure at the block level, providing e-mail and internet services and conducting computer based training programmes. But they have only been partially successful in facilitating distance

education and G2C services. The objective of using CICs as a tool for sustainable regional development has not been satisfactorily achieved as they are providing mostly limited information and services which are not directly augmenting the rural productivity in a desired manner. To achieve some of the stated objectives of the CICs, a stronger coordination between the state government and the CICs is required. In order to make the CICs more viable and effective in achieving regional economic development there is a necessity for wider coverage of G2C services, a better awareness campaign and region-specific innovative services. Involvement of the private sector for economic sustainability of the CICs in future may also be a necessity. Further research is needed to verify the scope and viability of involvement of NGOs, the private sector and corporate bodies. Such an effort has already taken place in some states of India. Evaluative studies incorporating the requirements in changing circumstances in the rural areas may need to be undertaken. Such an effort should provide future guidance to the service providers so that relevant ICT services can be provided to the rural population.

NOTE

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KEY TERMS

Block: An administrative unit in India which occupies fourth place after centre, state and district.

CICs (Community Information Centres): Information Centres set up by the Government of India in the north eastern region of the country to provide IT related services with internet access to the rural population.

Digital Divide: The gap in accessibility of ICT and its related services.

G2C (Government to Citizen) Services: Different citizen centric services provided by the government for the benefits of the citizen. These include providing birth and death certificates, records of rights of land, information on govt. schemes and so on.

ICT Diffusion: Spread of ICT benefits to the majority of the population for using ICT to increase productivity and regional development.

NGOs (Non-Governmental Organizations): Associations of like-minded people serving the society specially the downtrodden and vulnerable sections on their own or supplementing the organized effort.

Sustainability: A situation in which a particular mechanism is viable for a longer period.

Transparency in Government Services: A mechanism by which citizens know and understand the different activities of the government. Information on functioning of different government machineries is made available to the citizens.

UPS (Uninterrupted Power Supply): A mechanical/ electronic device used to provide power supply without any disruption at the time of power failure. This is mainly used in computers as a power back up.

VSAT (Very Small Aperture Terminal): An earthbound station used in satellite communications of data, voice and video signals, excluding broadcast television.

ENDNOTE

[1]   The instances of Andhra Pradesh State Wide Area Network (APSWAN) in Andhra Pradesh, Keltron Information Kiosks (KIKs) in Kerala, Gyandoot Dotcom Project in Dhar District of Madhya Pradesh, Development of Humane Action Network (DHAN) in Tamil Nadu, M. S. Swaminathan Foundation, Drishtee, etc. reflect the success of involving government, NGOs and private sectors in bridging the digital divide in some Indian states.

ICT, Education, and Regional Development in Swiss Peripheral Areas

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INTRODUCTION

Since the end of 20th Century, the introduction of Information and Communication Technologies (ICT) has deeply influenced many aspects of everyday life, leading to the creation of new meanings for the traditional concepts of identity, culture, economy and, above all, communication (Mantovani, 1995; Perriault, 1989; Rullani, 2002). Trends about technological development show how, in the next years, the change will gradually concern all elementary daily actions, due to spreading of the electronic devices in the environment (OCDE, 2002; Saracco, 2003). If ICT will be ever more deeply-rooted in our reality, how fast will they consequently influence our socio-cultural identity? What sort of consequences do we have to imagine at economic level? What variety of scenarios can we draw about our future? And, above all, how will the concept of development change?

If on the one hand the global trend seems to lead towards a reality without any kind of borders, on the other one the political and cultural centres are privileged in taking advantage of the opportunities opened by ICT. Therefore, peripheral areas[1] run the risk of becoming more and more isolated and excluded from the innovation process. Is it possible to reverse this tendency by using ICT as developmental devices? Can we re-direct the attention on those areas that seem to be "dead" regions? And in what way?

BACKGROUND

The relationship between communication and regional development has deeply influenced the fate of a great number of geographical areas; examples are the building of railways, of roads and fluvial connections. If and in what way can the CmC[2] be considered a factor, parallel to those we have mentioned, to open new opportunities for peripheral regions?

The rapid spread of communication networks—ignoring the presence of natural and political boundaries—is changing the economic and social scenarios. In this context, new kinds of "regions" are emerging, the so-called "learning regions" (Florida, 1995). They are characterized by a system in which communication networks and data processing work give both shape and substance to connections between public institutions (such as schools and universities) and private institutions (firms), this leading to generate new knowledge and productiveness.

In Switzerland, a country characterized by a strong multicultural and multilingual tradition (above all in valleys of alpine regions), the creation of a new idea of "region" meets several kinds of dissensions. There are a lot of questions about the way to get over mental and cultural borders (see Arnaud & Perriault, 2002; Bressaud & Dirtler, 2003; Calvo, Ciotti, Roncaglia & Zela, 1998).

The behavioural changes always continue in daily action, and the action always places itself in a human, social, geographical, cultural and economic territory (Brown, Collins & Duguid, 1989). The use of communication devices can't escape this rule, because they've got a sense if they can be interpreted and situated by the people who live in that particular area (Galimberti & Riva, 1997). The process of interpretation of these devices had to consider, on the one hand, the starting of forms of "unlearning" (Grabher, 1993), and on the other one the building of a different nature of the concept of territory that has to be identified and tested (Delai & Marcantoni, 1992).

REGIONAL DEVELOPMENT IN SWISS PERIPHERAL AREAS

Situation in Peripheral Sub-Alpine Regions

Swiss reality is characterized by fragmentation at several levels. From a geographical perspective, the mountainous territorial morphology creates several natural partitions, causing the isolation of some areas and particularly those distributed along the Alpine chain. Besides, the Swiss Confederation is a set of 26 political Cantons, each of

these having its own administrative independence even if partial, and with four official languages[3]. At a deeper level, the fragmentation is perceived as socio-cultural complexity: geographical and political configurations, in fact, don't correspond to an unequivocal identity; very often different cultural and language realities—including dialects - are present on the same territory, giving it a cross cultural profile[4].

The process of globalisation over the last decade has led to the trend of concentring the power in the centres, namely those places having infrastructures and accessibility to innovation, and so to choose a developmental way. These centres become the reference point for all the relevant activities. These are the "places of the knowledge," the places where people decide the future trends of development, definitely the places that the peripheral regions "gravitate around." From this perspective, the break between central and peripheral areas becomes even more perceivable. Peripheral regions seem to have neither any kind of power about their future development, nor interesting elements making them recognizable as "cultural regions." If this trend is observed at a general level, now it has repercussions also on Swiss Confederation, European symbol of a perfect integration between different cultures and ethnic groups.

What is actually going on in these regions, often coincident with valleys? First of all, it is important to point out the trend of native people moving out from the territory, frequently youth, to find a better working perspective just in the centres. This leads, obviously, to a progressive death of the local economy and working activities. The economic sphere, anyway, can't be separate by the question regarding education, in which the working world is deeply-rooted. If this movement from the regions begins in the young age, it's necessary to understand the reason underlying that.

During the period of education, the young decide to abandon his/her own place of origin to look for better education and training opportunities. In some cases, the young have no other choice. This problem is strongly felt about vocational training, that represents a relevant portion of educational system: more than 60% of young people, in the age of secondary education, choose the way of apprenticeship. Swiss apprenticeship is based on the dual vocational system coming from the German tradition. Apprentices work in a company or small firm and at the same time attend Vocational School. The dual system spans over the whole training period, up to four years, thus insuring the connection between school and education and the working world. What happens in remote regions? Vocational Schools collect different professional trainings and are often dislocated far away. The apprentice is forced to leave his native territory during the week to move to the place where he can study and carry

on his/her apprenticeship in a firm. This situation of eradication from the native territory leads the young to a progressive loss of his/her own socio-cultural identity, to get hold of the place he/she will study or work.

Finally, we have to face a sociological problem: the development of a negative mentality. If valleys are characterized by the elements mentioned before, the young person—but not only our youth—is led to relate his/her native region with lack of real opportunities for the future, and definitely not to recognize any chance of development.

What long-term consequences can we imagine for the increasingly isolated valleys? How is it possible to intervene, so as to change this vision about the future? Can the introduction of ICT change this situation?

Swiss Regional Development

Since 1995, Swiss peripheral zones of sub-alpine arch (see Figure 1) are involved in projects of regional development, based on the conviction that changes take place not simply by giving direct financial support, but by setting up educational and training devices, to achieve a revaluation of these regions as characterized by their owns specific social, cultural and economic values and so to allow them to survive both on the identity level and the economic one.

Poschiavo Project: A Pilot Project

The pilot project, Progetto Poschiavo[5], started in 1995 involving the area of Poschiavo Valley, a region of the Grisons Canton at the boundaries with Italy, speaking Italian, German and Romansh. The aims of the project were both the revaluation of the cultural and linguistic reality by a human ecology approach[6], and the realization of a communication network that allows a cultural exchange not only within Poschiavo region, but also between this territory and the centres, to promote a reversal of the tendency towards isolation.

From a practical point of view, the project followed a regional development strategy founded on the direct involvement of the local people. After an initial contact with local institutions, a group of people was trained to take the role of Practice Assistant in Distance-Education (APFD)[7], to accompany the local population in project of territorial development. In this sense, it was important that APFD were native people, to avoid any hindrance to the developmental process itself. The second step was the setting up of project groups (composed of local people and accompanied by an APFD) and the introduction of Information and Communication Technologies. During this period, participants acquired both the means to "read" the territory through a human ecology approach and the necessary know-how to use ICT. The project

Figure 1. Swiss peripheral territories involved in projects of regional development
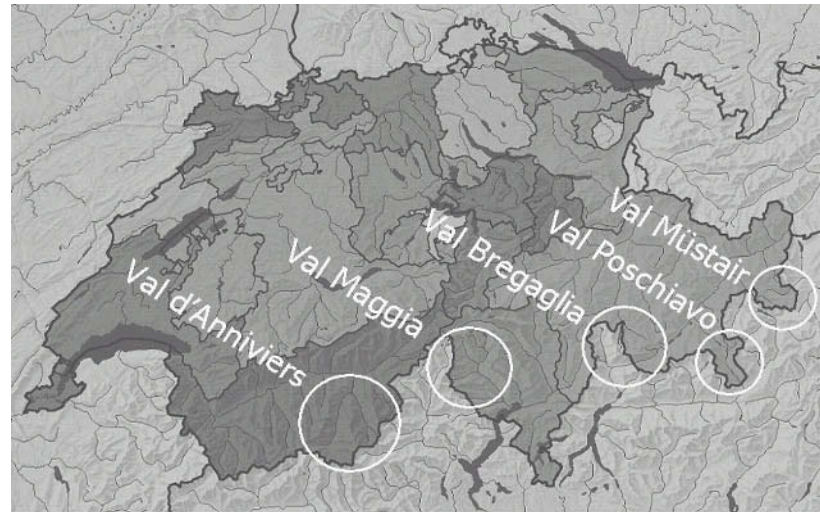
groups took the role of connection between the valley and the centres. Finally, in a consolidation phase, project groups began a more operative and practical work, involving in their activities the whole population and local Institutions.

Nowadays, we can observe a new trend for Poschiavo Valley, characterized by a consciousness about the value of its own cultural identity, a new esteem of the role of education in processes of regional development, a consolidated trend to self-entrepreneurship and a resumption of economic vitality. A simple example is represented by Polo Poschiavo: a body born from the pilot project, now institutionally recognized as a reference point for the development of the region, that is the promoter and responsible for some training projects in the valley.

The progress of the Poschiavo Project and the relapses of the project itself (Rieder, Giuliani & Schürch, 2000; Schürch, 1999, 2000), show how it is possible to achieve concrete regional development, without betraying the region's historical and geographical roots, to satisfy the demands of the present time and create innovative scenarios for future years.

movingAlps Project

In 2000, these outcomes lead to the birth of the movingAlps Project[8], based on Progetto Poschiavo experience and representing its natural consequence. If the old Poschiavo Project focused on a limited area, movingAlps extends its action field to all the peripheral regions of the sub-alpine arch at the boundaries with Italy.

movingAlps tries to work out and to practice a regional development model that may represent both a rediscovery of the peripheral areas as characterized by specific ele-

ments and a chance to increase the values of these areas themselves. To allow the isolated regions to identify and develop opportunities that may be synonymous of social and cultural identity survival[9], movingAlps chooses to start moving from local people project ideas. This implies an analysis of the ground and of people expectations and representations about their future. Financial support is given only in a second time. By this strategy, the developing process not only fits the demands of the region, but it's shared by the involved people. This also allows the creation, step by step, of a new vision about the opportunity to act on and modify the current situation going towards a better one. The process of development is then characterized by a steady and progressive adaptation of the project to consider and to include the unexpected elements rising up from the territory and people living in.

In conclusion, movingAlps aims to:

1. Perform a change of social perceptions, allowing a gradual and progressive re-appropriation of entrepreneurial, working and formative culture that finds its origins and nourishment in the region itself;
2. Overturn the relationship between centres and peripheral areas, to reverse a process of progressive isolation of the peripheral zones as regards to the centres, and to reach a joint and mutual exchange of knowledge and culture.

The Role of ICT

How to achieve this reversal of relationship between centres and peripheral regions? In this developmental approach, the introduction of Information and Commu-

nication Technologies (ICT) can play a central role, both by making easier the involvement of the isolated zones in the intercultural exchange typical of the global village and by supporting a push towards innovation and development.

To overcome temporal and spatial barriers by ICT means the establishment of continuity and interchange relationships between centres and peripheral areas. ICT enables the onset of a process of de-centralization of knowledge, by offering the opportunity of training "in situ" that may emphasize the value of the cultural traditions of the territory which people belong to.

From another perspective, this process leads to a renewal and updates the knowledge and skills acquired over the formative itinerary (Schürch, 2004). Education and its links with the economic and working spheres have obviously to be considered as the key-points from which development becomes possible. ICT, in this sense, provide access to a kind of knowledge that is typical of the information age and that's becoming the base enabling participants to act and work in the future daily life.

Education and ICT in movingAlps Project: A Concrete Micro-Example

A concrete example of regional development with the help of ICT is represented by a project[10] involving the vocational school of Samaden, in Bregaglia Valley, and in particular a class of bricklayer apprentices living in various dispersed locations in the valley.

As mentioned previously, apprentices are forced to leave their villages to reach the place of study and carry on their apprenticeship. Often this situation leads to migration to these centres and consequently to an abandonment of the native valley. On the other hand, a series of studies in Bregaglia Valley[11] have pointed out how it is characterized by the presence of multiple diversified sectors of production, covering the entire outline of traditional regional activities. This means a working reality that is still alive, at least at a potential level. The question is: how to meet young people's demands and to rebirth the local economy?

The way chosen by movingAlps-Bregaglia was to develop a net of collaborations between educational bodies and private firms by using ICT, to allow the apprentices to study without leaving their locations in the valley. This should lead, on one hand, to creating the necessary conditions to encourage the introduction of young people in the local working activities, but also lead to a renewal of the professions based on the new approaches brought in by the apprentice who has learnt to use ICT.

The experience of Progetto Muratori, started in May 2002 and stopped in June 2003, has given the opportunity to a group of 12 bricklayer apprentices to attend courses in General Studies and in Professional Knowledge in a blended-learning form[12]. The course ran from December 2002 to May 2003, and took the form of three three-week distance sessions alternated with periods of classroom-based learning. Over the distance-learning phase, communication and interaction between apprentices, teachers and the other people involved in the project has been secured by a virtual learning environment (Giorgi & Schürch, 2004).

This experience shows, at several levels, what are the opportunities arising from a territorial intervention. Briefly, it has lead to:

1. Overcoming the problem of spatial and temporal distances—by the use of technology—leading to apprentices having wider accessibility to training and to knowledge in general;
2. Moving from a vocational training based on the culture of the "places of knowledge" towards an education founded on the values and on the identity characteristics of the native region;
3. The development of a training system preparing young people to face changes due to the introduction of ICT in professional world, by integrating them within the formative itinerary; and
4. The development of the necessary basis for a revaluation of vocational training and of professional activities within Bregaglia Valley, and an input towards innovation.

CONCLUSION

Regional development goes through both the revaluation of the culture and of the regional identity, and education and training in a large sense. To be effective, this process has to occur at different levels; some can be considered at micro-levels (as in the case of Progetto Muratori, focused on a limited target), others regard wider spheres such as the projects of territorial development considered as a whole. Sharing of future sceneries and collaboration between institutions and local people are central elements for development that becomes possible.

Information and Communication Technologies offer interesting tools for the revaluation of peripheral areas own identity, introducing at the same time a wave of innovation. It's not a question of assimilating a particular territory to defined standards but instead to make the innovation a means to give a new value to the culture, economy and local identity.

However a question still remains open: Is it possible to define a model of regional development, integrating ICT, that is flexible enough to be adapted and transferable to every territory? Furthermore, can such a model be characterized by a defined structure of functioning?

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KEY TERMS

Developing Project: Creation of a small group of people that work on an existing problematic theme and design solutions where Information and Communication Technologies make sense.

Human Ecology: In a holistic vision of the environment, human ecology is an approach to read changes and transformation in action; a way of integration of history, culture and work in peripheral regions in a communicative and distance-exchange perspective; a tool for creating conditions for sustainable development.

Information and Communication Technologies: Technology referring to IDP systems; examples include the Internet, videoconferencing, videostreaming, text-editing, robotics, productive processes automation, etc.

Peripheral Regions: Geographical areas characterized by a particular territorial morphology that causes the isolation from bordering zones inhabited by a linguistic and cultural identity minority. Areas cut off from economic and cultural development.

Regional Development: The notion of development that has been recently better defined with the concept of "learning region" ("regionalità apprendente") that suggests the existance of a dynamic net of relationships among different activity sectors (economic, administrative, educational and cultural) of a region. It is thought that education and training represent the central device of such development.

Regional Edentity: Is a linguistic and cultural concept linked to the feeling of belonging shown by the inhabitants.

ENDNOTES

[1]   For example, mountainous zones.

[2]   Computer-mediated-Communication.

[3]   These are: French, German, Italian and Romansh.

[4]   For instance, in some areas of the Grison Canton, which is open to Italy and where Italian is spoken, we can perceive that, although politically belonging to Switzerland cultural traditions are strongly rooted in Italian culture.

[5]   Progetto Poschiavo is born from the collaboration of Istituto Svizzero di Pedagogia per la Formazione Professionale (ISPFP) of Lugano, Cantons Ticino and Grisons, Jacobs Foundation, Progetto Poschiavo Foundation, Ufficio Federale per la Formazione e la Tecnologia (UFFT), Swisscom, University of Svizzera Italiana of Lugano, University of Ginevra, University of Neuchâtel and University of Bologna; web site: http://www.progetto-poschiavo.ch.

[6]   The concept of "human ecology" refers to the environment in a global sense, originated by the consideration of all its components and where the human being has an important role.

[7]   The APFD, or Assistente di Pratica in Formazione a Distanza was a new professional category created within the ISPFP of Lugano; their role is to accompany groups of development projects, offering both technical and pedagogical assistance, sometimes at a distance but mainly face-to-face. The particular characteristic of the APFD, however, is that they originate in the same regions as the people themselves, and so share the same socio-cultural background as the people they are working with.

[8]   As Progetto Poschiavo, movingAlps derives from the collaboration of Istituto Svizzero di Pedagogia per la Formazione Professionale (ISPFP) of Lugano, Cantons Ticino and Grisons, Jacobs Foundation, Progetto Poschiavo Foundation, Ufficio Federale per la Formazione e la Tecnologia (UFFT), Swisscom, University of Svizzera Italiana of Lugano, University of Ginevra, University of Neuchâtel and University of Bologna; Web site: http://www.movingalps.ch.

[9]   Obviously, in a sense of multi-culture and multilingualism survival.

[10]   That is Progetto Muratori.

[11]   The studies were carried out by ISPFP-Lugano and Politecnico Federale of Zurigo.

[12]   Either face-to-face or through ICT-based distance learning.

ICT–Based Community Development Initiatives in South Africa

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INTRODUCTION

South Africa has seen many changes in the decade since the mid-1990's but it is still struggling to rectify the damage caused by apartheid, which aimed to maintain white domination while extending racial segregation and emphasising territorial separation (Chokshi et al., 1995). The legacy of apartheid has left a large percentage of South Africa's population living in poverty, many without proper housing or associated facilities and minimal, if any infrastructure. Another devastating effect of apartheid is the high percentage of illiteracy within South Africa due to the lack of educational amenities available to non-whites during that era. Fifty percent of the population of 42 million lives below the poverty line while 13.6% of the population aged 15 and over is not able to read or write (*World Fact Book*, 2003).

Figure 1. Geographical distribution of ICT community development initiatives
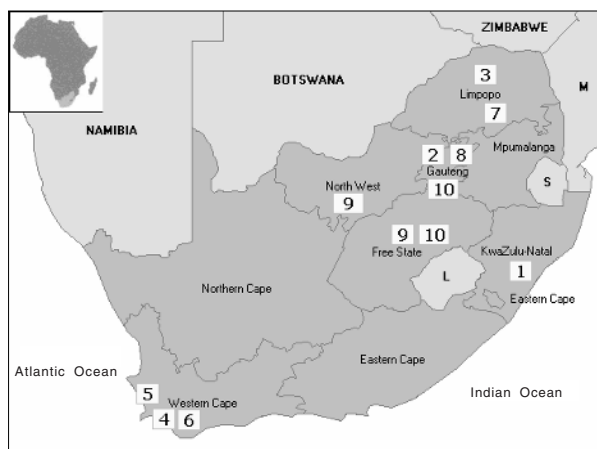
Many of South Africa's cities are of First World standards with access to advanced technologies, yet poverty-stricken areas are still stuck in the Third World, providing inhabitants with, in many cases, not even basic needs fulfilment. World economic trends show an increasing reliance on information, supported by technology. Without access to the necessary technology to attain knowledge and information as well as efficient communication, a significant number of South Africans are destined to remain in an impoverished state (Cogburn, 1998).

BACKGROUND

Internet, Electronic Commerce, Globalization and the Digital Divide

The Internet in conjunction with other enabling technologies is fuelling globalization, and electronic commerce is drastically changing the way in which modern-day business is conducted (Stavrou et al., 2000). E-commerce enables business transactions to extend across international borders and allows relationships to exist on a global level. The downside to this business evolution is that it threatens to widen the abyss that already exists between the active participants and those unable to participate due to lack of resources such as technology infrastructures, technology itself, skills and education. Deprived of the necessary infrastructure for conducting business via e-commerce and the Internet, business contenders are left at a severe disadvantage.

One way to gauge the digital divide within a country is to look at its ICT penetration (Corrocher & Ordanini, 2002). In a developed country such as Sweden, 66% of the

country has *regular* Internet access whereas in South Africa only 15% of the population has *any* form of access. Within South Africa, approximately 10% of black residences have telephones in their homes, in contrast to the 90% of whites (Miller, 1999).

ICTs and Community Computing in Bridging the Digital Divide in South Africa

Community centers incorporating ICT can aid in bridging the digital divide by providing access to information and facilities to indigent community inhabitants. Such centers can bring communities together to create a knowledgeable society, strengthening the population, and improving its ability to fight poverty (Cogburn, 2000).

Many factors must be considered in providing Internet access and computing facilities within a South African context. These include funding, resources and current infrastructures as well as the willingness of community members to accept and make use of the amenities.

Table 1 gives an overview of some community-oriented ICT initiatives, selected for their diversity in geographic location and structure. Figure 1 shows the geographic distribution according to province. Note that some projects have multiple locations. Although most projects have multiple goals, they have been classified below into two main categories according to their main thrust: (1) providing a basic ICT infrastructure to a disadvantaged community in the form of business or telecentres,

Table 1. Selected South African ICT community development initiatives

Nr	Project Name	Year	Sponsor	Main Objective
1	Manguzi Wireless Internet	1998	CSIR (SA Government)	Internet connectivity
2	Kgautswane ICT Centre	1999	Worldbank	Computer infrastructure
3	Mogalakwena HP I-community	2002	HP (private)	ICT infrastructure & training
4	Khayelitsha Mini-telecentre	1999	USA (SA Government)	ICT infrastructure
5	Milnerton Library Business Centre	1999	Provincial Government	Digital information access
6	Zenzele Training & Development	1988	Mfesane (Christion NGO)	Information access & skills training
7	Bridges to the Future - SA	2002	consortium (public/private)	Adult literacy
8	Microsoft Digital Village	1997	Africare (corporate consortium)	Literacy & Internet skills
9	FET.com ICT Education	2001	Marconi (private)	ICT skills training
10	Project Literacy	1976	NGO (private)	Adult literacy

and (2) initiatives going beyond infrastructure delivery, aimed at ICT-based adult literacy and skills building to thus actively engage in community upliftment.

SOUTH AFRICAN ICT INFRASTRUCTURE PROVIDING COMMUNITY INITIATIVES

The following are some representative initiatives involving ICT that have attempted to bridge the digital divide and provide a means of communal computing for impoverished South Africans. This is not an attempt to provide a comprehensive inventory of all the ICT community development initiatives, but rather to demonstrate the diversity of ICT-driven development initiatives in the country. For a comprehensive listing of ICT community development refer to Bridges.org (2003).

Manguzi Wireless Internet

Manguzi Wireless Internet project provided Internet access and e-mail via a dial-up link, as well as learning resources to a community in Kwazulu-Natal where no telecommunications infrastructure existed. This was achieved using radio and satellite broadcasting technologies. The centre has been in operation since September 1998 and access to the Internet was established within the centre since May 1999.

Manguzi is a poor, rural community where most people can't even afford a bicycle. The center, therefore, had to be located to accommodate the largest possible clientele. The project needed to be inexpensive, robust, reliable and suitable for a particular application (i.e., Web browsing, e-mail and Internet connectivity) in a sparsely inhabited rural area. Local schools requested to be part of the project in order for Internet access to be available to their students. Two schools were nominated to participate in the project and both were fitted with a single computer, a radio with an antenna, a satellite receiver card and a DSB dish. A Telecentre served as the hub of the network and has two parts: a phone structure with five telephone booths and a fax machine, and an IT component consisting of a LAN with 8 PCs. A computer at the Telecentre served as a router and was connected by radio link to the computers at the schools. The information requested was downloaded directly to the schools' PCs via satellite. The schools were provided with infrastructure and teachers were trained in how to use a computer, e-mail and the Internet as a teaching tool (Stockholm Challenge, 2003).

The main aim of the project was to facilitate access to opportunities and information as well as to create local ICT capacity and in doing so to make a tangible difference

in the lives of the community dwellers. Since the members of the community were actively using the Telecentre, it can be said that the aims of the Telecentre were being achieved.

Several lessons were learnt in the implementation of this project. First, it is essential to get the support of the community before implementing any solution as the mix of the tribal leader's authority, government and project legislation as well as historical issues poses unique challenges. It is also vital that all involved are realistic about what can be achieved with the introduction of ICT. Technology is important, but it is only beneficial if installed according to the community's needs. In addition, the infrastructure and software must be robust enough to withstand the rigors of rural life, and the community must be able to support the technology. The solution must be easy to install and use, as well as inexpensive and easy to administrate (Manguzi, 2004).

Kgautswane ICT Centre

Kgautswane is a remote village with no electricity and, before the project was implemented in 1999, no telephone access. The aim of the project was to provide the community with access to computer and business equipment and related services. Funding came from the World Bank. A petrol-driven generator provides power and the Centre was operated for up to 18 hours per day. Members of the community who have received adequate training provide computer training for the Centres' users. Because the Centre had initially been fitted with only one telephone line, no fax or Internet service was available. However, there are intentions to provide these services when more lines are available.

In evaluation, it appears the Centre was used more than initially anticipated. The level of computer literacy and ability to train are higher than expected and hence there was a huge demand for more PCs (Stockholm Challenge, 2003). This is an example of a successful project. The community showed a desire to receive the equipment and, once installed, used the Centre to capacity. This provides evidence that high tech equipment can be used effectively in a remote, rural setting.

Mogalakwena HP I-Community

An 'HP I-Community' project "is designed to narrow the social, economic and digital divide by facilitating technology access, education/learning opportunities, employment/job skills transfer, community building/increased civic involvement, and economic development to a specific community….Each project is run with a view to replicating the successful elements in another part of the country, or another country" (Mbeki, 2003).

Mogalakwena aimed to provide a model developed in the actual conditions of a South African rural community, which could be replicated in other rural areas. For the first 12 months, the project dealt with the provision of necessary infrastructure. All that the community had at the start of the project was electricity and some telephony. Over 20 community computer access centres were established and more efficient access was established by means of fiber optic cables, wireless-radio and satellite. All centres have computers and employ people trained to use and facilitate access to computers and the Internet.

So far, the project has trained more than 1,000 people in skills necessary to use the ICT available and provided opportunities to all community members to meet their needs. The project also trained people to maintain and support and service computers, therefore making maintenance of the centres easier (Mbeki, 2003).

Khayelitsha Community Owned Mini-Telecentre

The Centre was part of the government's MPCC (Multi-purpose Community Centre) programme and situated within the township. It had three rooms for reception, computer, phones and was open during normal working hours. At the time of publication, the facility had four computers, a printer, a photocopier, and a scanner. It offered telephone usage, photocopying, typing, fax, computer usage and computer training. The manager and staff working at the Centre were required to have computer and business skills.

Those involved in the establishment of the Centre felt they have been successful in bringing services closer to needy people. However, they would like to have more advanced equipment and access to the Internet. Despite their success, the Centre does experience financial problems.

The long-term goal of this facility is to serve as a local/information resource centre, where people can use computers and the Internet and receive computer training. They aim to develop a local community newspaper and a community directory in which they can publish information about the community. They also wish to serve as a government information point, and act as a support centre for SMMEs.

Milnerton Public Library Business Corner

The Centre is a government-owned library and is part of the Provincial Administration of the Western Cape's Library Services programme. It is part of the provinces

programme to establish mini-business centres in public libraries throughout the Western Cape. To date, more than 60 of these "business corners" have been established. As an example, the particular facility located in Milnerton currently had 13 computers and printers as well as photocopying and scanning equipment. Over and above the regular library services, the services offered at the centre include phone calls, Internet, community information, government information, education services, business support, and developing local information. The staff are required to have appropriate certification and training. A large number of school-going children as well as community members use the Centre. Awareness and fundraising are conducted via community outreach initiatives, golf days and fun runs/walk events.

The Centre plans to develop a community directory and to publish information about the community. Other goals include acting as a Government information point and as a support centre for SMMEs, and to form private partnerships with business in the community in order to generate funds.

Those involved in the library felt they have been successful but would be more so if they had more funding and staff. They felt the Centre has made a difference in the community by informing, educating and empowering residents through access to facilities and knowledge.

Zenzele Training and Development

This NGO-owned, multi-purpose Community Centre was opened in 1998. The Centre has equipment similar to the Milnerton Public Library's centre and has similar long term goals: to serve as a place where people can use ICT and receive computer training and act as a support centre for SMMEs.

Those involved with the implementation of the Centre felt they have achieved success. Their greatest success was the creation of employment and the provision of basic skills for people within the community to enable them to become self-employed. They felt they would have greater success if the centre was more self-sustainable. An additional problem was that the facility was not easily accessible via public transport.

SELECTED ADULT EDUCATION ICT INITIATIVES IN SOUTH AFRICA

The following is a selection of some ICT initiatives going beyond infrastructure and connectivity provision by having an educational focus. Many of these are aimed specifically at improving adult literacy, although they are typically based in and also used by secondary level schools.

The Bridges to the Future Initiative South Africa (BFI SA)

The BFI SA has joined forces with other governmental and non-governmental organisations such as the National Department of Education, the Provincial Department of Education, SchoolNet SA (SNSA), the Interim Steering Committee and the International Literacy Institute (ILI) to improve life skills and literacy of the poor and people living in previously disadvantaged areas (BFI-South Africa, 2003).

The managing agency is the Consortium Steering Committee. The main aim of this initiative is to increase basic literacy and ICT skills to an estimated 6.5 million youth and adult learners over a five-year period. The initiative also aims to create 240 fully resourced Community Learning and Technology Centres (CLTC) as well as software in various languages for educator development and for self-help learning. The projected cost for this initiative, which commenced in March 2002, stands at R37 million (WEF, 2002).

CLTCs will contain ICT learning resources that are aimed at illiterate adults (and youths). BFI—SA will build onto the existing ICT infrastructure in secondary schools, whereby illiterate adults and youths can utilise these resources after school hours. With regards to the software to be utilised, it will be tailored to meet the needs of the illiterate and introduce concepts based on their daily activities. This will be implemented with the help of the SNSA and the ILI. The type of media incorporated in the daily classroom will include digital video, audio and interactive animations. Training will also be provided to educators to improve on their ICT skills. The next step is to introduce the CLTC centres into the Limpopo province in 2004 (BFI-South Africa, 2003).

Microsoft Digital Village

The Microsoft Digital Village, launched in 1997, is an initiative of Africare based in Washington DC. The managing agency is Microsoft with other contributors such as Hewlett-Packard, Kodak, Intel and Old Mutual. The Microsoft Digital Village's main aim is to provide communities, schools, students and entrepreneurs with up-to-date technology to improve their literacy skills and to be able to communicate and utilise the tools offered by the Internet (WEF, 2002).

The FET.com ICT Education Project

The FET.com ICT Education Project hopes to develop ICT skills through the use of e-laboratories. This project, managed by Marconi and the Department of Education, is

funded internationally by the British Council, and nationally by Telkom, South Africa's only fixed telephone line provider.

The main aim of this project is to develop ICT skills for secondary scholars, adult learners not in the education system and educators. Phase one of the project is estimated at R17 million and the commencement date was May 2001 (WEF, 2002).

Project Literacy

Project Literacy is a 28-year-old NGO focussing on Adult Basic Education and Training. Project Literacy reaches 2,500 adult learners annually at centres in Gauteng and Middleburg in Western Cape. Four provincial education departments have been established using Project Literacy's training and materials. The project also provides services to parastatals, industry and mining houses.

Project Literacy's mission is to provide adult basic education and training programmes on a nation-wide level to educationally disadvantaged adults by way of adult education centres, teacher training, curriculum development and community outreach. "Reducing South Africa's illiteracy rate is a major national challenge as illiteracy rates are detrimental to foreign investment, development programmes and the general social and economic upliftment of South Africa's people" (Project Literacy, n.d).

CONCLUSION

In South Africa, the racial inequities in wealth, education and other basic resources left by the legacy of apartheid are still very apparent 10 years after the establishment of democracy. The majority of the formerly disadvantaged are finding it difficult to enter the modern economy with its dependence on ICT. Many projects are being undertaken to bring ICT resources and training to poor and often rural communities. Most are small, some are supported by government, others by NGOs and foreign aid programmes and a few are community supported, but all are making a difference on the lives of the people who have access to these centres. By providing access to phones, faxes, computers and the Internet, users learn skills and can access the knowledge, communication and opportunities that enable them to compete in today's technology-driven market. The key to empowering poor and undereducated South Africans is to provide them with the means to lift themselves out of their poverty. The many small telecentres being established around South Africa are providing just these opportunities. However, not all ICT interventions are equally successful. A number of contingency factors need to be in place for continued success: communications infrastructure, community buy-

in and support, a sustainable revenue model and, last but not least, trained and committed staff.

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KEY TERMS

Apartheid: Afrikaans word literally translated as "separate-ness" to denote the official government policy of segregation and separate development along racial lines as practiced in South Africa from 1948 until 1991. This was enforced by several laws, *inter alia* the Immorality Act (prohibiting sexual relationships across races) and the Group Areas Act (allocating and forcibly moving people to specific geographic living areas).

Digital Divide: The gap between countries or communities with and without access to technology, usually because of a combination of economic, socio-political and historical causes. The differences relate to ICT infrastructure and human resources and skills although it is usually used in the context of the inadequate Internet connectivity in developing countries or in underdeveloped regions.

Literacy: A literate person is defined by the UN and World Bank as someone who can, with understanding, both read and write a short simple statement on his or her everyday life. In many contexts, a wider definition is used and literacy is seen to include additional skills such as numeracy and practical problem-solving skills relevant to daily life.

MPCC: The Multi-purpose Community Centre (MPCC) is the South African government's implementation of a telecentres aiming to provide historically disadvantaged communities with one-stop access to government and other digital information. There is no standard configuration since, in principle, the MPCC is configured in response to community-defined requirements. Although the initial MPCC setup is funded by a consortium of national and local government and the private sector, the MPCC is supposed to be fairly self-sustaining in the longer term—a difficult challenge in most cases. At the time of writing, more than 50 MPCCs have been established throughout South Africa.

RDP and GEAR: The Reconstruction and Development Programme (RDP) was the first democratic government's socio-economic policy framework designed to narrow the infrastructural gap between the poor and the rich. This includes ambitious goals for the provision of houses, services, education and health care. This was only partially successful and was followed up in 1997 by GEAR (Growth, Employment And Redistribution strategy), a more comprehensive macro-economic policy aimed at creating a sustainable overall economic growth and employment opportunities.

Telecentre: A shared, centrally-located community centrer equipped with the necessary ICTs and manned by adequately skilled staff to allow the community members to connect to the global communications network (telephone, fax and Internet). Usually additional office-like facilities such as photocopying, printing, scanning, and multimedia are also offered.

Imagining APNA Punjab in Cyberspace[1]

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DISCONTINUOUS AND CONTINUOUS SPACE

Akhil Gupta and James Ferguson have observed a motif of discontinuousness in modernist organizations of space. The modern map, which splits the world into a number of discrete, separate formations best illustrates the modernist premise of discontinuity (1997). Gupta and Ferguson discern a pattern of interconnected spaces marking the relations between groups and cultures (1997). This reconceptualization of space as interconnected has been triggered by the connectivity of the electronic media and new information and communication technologies (ICT).

The "deterritorialized space" of the electronic era decouples the naturalized link between space and territory in earlier productions of space. Places no longer remain attached to or bounded within discrete physical spaces. Nor does physical contiguity remain a key determinant in place-making as space is disengaged from place, culture and identity. The noncontiguous spaces of the digitized world enable places to be formed across geographical and national borders. As space becomes detached from materiality, places grow despatialized. With the possibilities for constructing place in hyperreality, places, cultures and identities no longer need to be fixed to real spaces.

The interconnected world created by new information and communication technologies should logically be expected to merge into a homogeneous, "undifferentiated space". But digital networks have simultaneously led to the fragmentation of space in new ways reproducing, at times, pre-modern spatial divisions. The reterritorialization of space in the contemporary digitized world compels us to rethink the formation of community, identity, solidarity and difference. The boundary-breaking electronic spaces have paradoxically resulted in the thickening and intensification of old boundaries due to their greater connectivity. If the electronic media have enabled the formation of global communities, they have also signaled "the return of the tribes" in various corners of the globe.

ICT, VIRTUAL SPACE AND NEW ETHNICITIES

Paul C. Adams and Rina Ghosh (2003) note a silence on the issue of ethnicity in the ICT debate in "India.com: The Construction of a Space Between". They argue that the topic deserves attention since people use ICT to construct a sense of community and personal identity, both of which relate to ethnicity. They contend that "when 'place-transcending' technologies facilitate the creation of ties through space and reduce the separation between here and there, negating place, this can strengthen a sense of ethnic identity, which implies a tie between self and place" (Adams & Ghosh, 2003, p. 416). Adams and Ghosh have invented the notion of the *bridgescape* "as a collection of inter-connected virtual places that support people's movement between two regions or countries and the sustenance of cultural ties at a distance." They believe that internet, along with 'a number of overlapping communicative links in different media spaces" creates the bridgescape, *a set of connections between here and there, in both a geographical and a cultural sense"* (2003, p. 420). This article will explore the reconstruction of a North Indian ethnic group, dispersed by the partition of the Indian subcontinent in 1947, in electronic space aided by digital and satellite networks, which interrogates the cartographic impulse in the making of the modern Indian nation that caused a rupture in the community's collective memory. Punjabi *retribalization* in the electronic public sphere heralds the return of regional, linguistic affiliations offering alternative imaginings of community that contest the imagined community of the nation. It interrogates the naturalization of national identity in modernism that has repressed other forms of "spatial commitment and identity" (Gupta, 1997, p. 179).

SPACE, GEOGRAPHY, NATION

Geography, a modern European method of organizing space representing itself as objective and universal, has dominated the epistemology of spatiality. Recent studies have implicated geography, the modern cartographic

Figure 1.

Figure 2.

Figure 3.

survey, measuring and division of space, in destroying indigenous places. Drawing on Jose Rabasa's (2001) concept of the palimpsest, Bill Ashcroft, for example, regards geography as a prime vehicle of colonial power and control through which the space of the colonized was erased and written over.

Similarly, Verba views geography and culture as playing a similar function in the production of the nation-state. He has claimed that "the creation of a national identity among the members of a nation is the cultural equivalent of the drawing the boundaries of the nation" (Pye & Verba, 1965, p. 530). Lucy Chester's (2004) description of Radcliffe's boundary as creative rather than descriptive in her analysis of the boundary dispute between India and Pakistan confirms geography's role in *inscribing* the boundaries of nations.[2] Chester contends that Radcliffe's hasty boundary making exercise seems to have been dictated not by factors like religious identity, the grounds for the Indian Partition, but by imperial concerns for not putting the writings of the empire in the rail, road and canal infrastructure under erasure. This confirms Carl J. Bonura Jr's contention that geography, believed to merely *describe* the boundaries of the nation-state, actually *inscribes* cultural spaces necessary for the nation-state's functioning (1998). The lines of the new nation dictated by Radcliffe's imperial ideology erases the earlier markings splitting the Punjabi, bioregional, ethno-cultural and linguistic memory.

But defining its political boundaries is more problematic given its many partitions. After the Partition of India in 1947, India received only a fraction of Punjab the major part having gone to Pakistan.

In 1966, India's portion of the Punjab was divided into three areas: Punjab, Haryana, and Himachal Pradesh with only the northwest of the region comprising Punjab, the southeast becoming Haryana, and the hilly regions in the northeast Himachal Pradesh.

The present Punjab retains only 38% of the area comprising undivided Punjab.[3]

INFOGRAPHY, VIRTUAL SPACE, POSTNATION

If geography was the modernist instrument of colonizing the spaces of others, infography appears to be the mode of recovery of the self in Punjabi *retribalization* through the *secondary orality* of the electronic media. From the earlier view of ICT as perpetuating old dominant structures of authority, the ICT discussion has now shifted to their appropriation by what Warf and Grimes call "counterhegemonic discourses" and their use by marginalized groups to challenge dominant structures: 'Marginalized people who are unable to express their needs and identities in the so-called real world, . . . can share interests and experiences in interactive discussion forums (chat rooms), forming classic "communities without propinquities," spaces of shared interest without physical proximity" (1997, p. 263). Though nationalities might have split loyalties between the region

and the nation in real spaces, the utopian congregation of an undivided Punjab is perfectly feasible in virtual reality. Punjabi groups use ICT to interrogate the boundary making act fracturing the Punjabi collectivity along sectarian, linguistic and national boundaries by reconstructing *punjabiyat* in cyberspace in relation to the preimperial, prenational Punjabi subjectivity. Punjab online, in contrast to real Punjab in India or Pakistan, projects itself as a transnational space defying all boundaries. For example, the homepage of *Punjabi Network* underlines the oneness of the Punjabi village.

Punjab is One

Punjabi Network welcome to all Punjabis worldwide.

Punjabi Network is proud to present a platform-let us make it a unique one-where Punjabis of any origin, any country, any creed or caste, any religion or nationality can meet and exchange ideas and thoughts. Punjabi culture is a common heritage of all of us.

Regarding nations and sects as divisive, it appeals to Punjab's ethnocultural and linguistic unity to affirm a collective memory.

We kindly request you to open up your heart and cleanse it from any nationalism, any religion or any regionalism.

We are not breaking Punjab into more and more smaller units, but uniting *all Punjabis to be a better community. The simple reason is we are a homogenous community with same language, same traditions and same culture. In our definition religious beliefs should be a personal matter or for that you can go to your nearest temple, gurudwara or mosque. Let us not mix religion, politics and culture in the same breathe. That is absurd and very explosive. That does not work. If you have different opinion then please be happy and wish you the best but do not force your views on others.*

Let us learn from our common heritage, our common culture and enrich it with our worldwide experience, knowledge and richness of heart.

Let us demonstrate to the world that despite our distances and differences Punjabis have a unique and common culture.

Let us be proud of our Punjab.

Punjab which lives in our hearts and souls and whose soil gave richness to our souls and a special strength to our genes.

ICT AND REGIONAL COMMUNITIES IN CYBERSPACE

Several examples of what Adams and Ghosh call Ethnic Group Online Nodes (EGON): "multipurpose sites dedicated to a particular ethnic group in India, usually written in the language of the group", may be found, such as *Punjabi Network, Punjab Online*, and so on. According to Adams and Ghosh, EGONs, which promote a sense of place and community, illustrate the notion of virtual place.

The description of APNA, a popular Punjabi Web site maintained in the US, can provide us an idea of the role played by EGONs in promoting Punjabi culture and solidarity among Punjabi ethnicities. As the only Web site on internet in *shahmukhi,* the Punjabi script used in undivided Punjab that was displaced by *gurmukhi* through Sikh nationalism, makes a linguistic return to undivided Punjab:

Web Site: APNA

APNA.

Academy Of The Punjab In North America (APNA) APNA, Washington, DC, USA

Supplied note: *"The web site of Academy of the Punjab in North America is dedicated to Punjabi literature and music. All the classical works of Punjabi writers as well as large selections from the modern writers are posted on APNA web page mostly in Shahmukhi script but some also in Gurmukhi and Roman/Punjabi script. There is a lot of material in English. The site has virtually thousands of pages and is a virtual library of Punjabi literature. There is also a very large selection of Punjabi music. This is the only Web site on the Internet in Shahmukhi. - sr."*

Site contents: ** Punjabi Radio; * APNA Chat; * APNA: Introduction and Objectives; * List of APNA Members; * APNA Discussion Forum (the debate on Punjabi language, literature and culture); * Punjabi Poetry (Audio); * APNA's Web Publishing; Punjabi Poetry (Shahmukhi - Special Section, Complete Works of Classical Poetry, Complete Books of Punjabi Poetry, Selected Poetry); * Punjabi Poetry*

*(Gurmukhi, Roman/English, English Translations); * Selected Punjabi Music; * Books; * APNA Events (APNA's Punjabi Conference at Harvard University, APNA's Punjabi Conference at Lahore, Release of Kalam Baba Nanak in Shahmukhi, Play: Loha Kut by Balwant Gargi, APNA's Second International Punjabi Conference, APNA's Fourth International Punjabi Conference); * Articles (in Shahmukhi, Gurmukhi, English); * Picture Gallery; * Let Us Talk! * APNA Membership Application Form.*

URL http://www.apnaorg.com/

Internet Archive http://web.archive.org/web//www.apnaorg.com/*

Link reported by: Safir Rammah (rammah @apnaorg.com)

* Resource type [news-documents-study-corporate info-online guide]: News/Documents/Corporate Info.

* Publisher [academic-business-govt-library/museum-NGO-other]: NGO

* Scholarly usefulness [essential-v.useful-useful-interesting-marginal]: Essential

* External links to the resource over 3,000-under 3.

Satellite Television: ETC Channel Punjabi

ETC Channel Punjabi, a Punjabi language television channel, aired a live telecast of a music concert in New York compared by a multilingual Sikh, switching between Punjabi, Urdu and English to strike a chord with the Punjabi audience of all ages, gender, class, caste, religion and nationality assembled to hear the Pakistani singing legend Reshma. While one would expect the diasporic space to reinforce ethnocultural proximity, a similar scene was replicated in Mumbai where Punjabis have gathered to celebrate Baisakhi, the Punjabi harvest festival at the annual Baisakhi show organized by ETC Punjabi, which was being beamed to Punjabi viewers across the globe. Punjabi actor Mink alternated between American English and chaste Punjabi to invite Javed Bashir from Pakistan to perform a song remixed by Birmingham based Bally Sagoo. Surfing over to MTV India, one was face to face with the *Apna Artist of the Month*, the Bhangra newcomer Mika, reenacting the Bhangra context for the benefit of the anglicized MTV VJ.

E-Groups

The members of the Punjabi Society at a "national" institution circulate trademark Sardarji jokes on the e-group even as they illegally share Punjabi music from across the continent by cousins in Southall and California as well as Jallandar and Ludhiana. A global *punjabiyat* is under construction in the virtual spaces created by televisions, telephones, computers and cassettes illustrating the telemetric visualizations of postmodern geopolitics.

ICT AND REGIONAL COMMUNITIES IN REAL SPACE

Internet and information technologies enabled the formation of new Punjabi virtualities in cyberspace formed by Punjabi Web sites, satellite television channels, cellular phones in which Punjabis converge across real space. But the networks formed in the information superhighway have also impacted real Punjab in concrete ways, which might have been divisive rather than cohesive.

Sikh Nationalism

The movement for Khalistan post 1984 offers a concrete example of the use of ICT in mobilizing Sikh groups for the Khalistan cause. It also proves ethnicities might reveal fissures along the lines of religion, gender, caste and class. The majority of Punjabi Web sites on the internet, though open to Punjabis of all sectarian affiliations, are dedicated to the promotion of the Sikh cause. A search on the Internet on Sikh sites leads one to the following:

- **www.sikhwomen.com** or **www.sikhwomen.net** - The Khalsa Women.
- **www.sikhamerican.org** - Sikhs in USA.
- **www.sikhsaustralia.com** - Web site by the Australian Khalsa.
- **Khalsapride.com** - A Web site with unique sections such as sewa and Dastar Gallery.
- **http://www.iigs.com/** - International Institute of Gurmat Studies, Inc. This organization has been doing great sewa to Sikh community for last 29 years by holding Gurmat camps for young khalsas.
- **World Sikh Youth Forum** - The purpose of this Web site is to keep the Sikh youth of the world informed about our heritage and about the recent events of the world.

- **www.sikhnet.org** - A site maintained by Sardar Gurmustak Singh ji Khalsa.
- **www.sikhfoundation.org** - Preserving Sikh heritage through publications of very high quality journals.
- **www.gurmat.com** - A site where Sikhs can seek matrimonial partners.
- **www.holyshrine.com** - A highly recommended site which you can use to arrange your tour to the Sikh shrines in Pakistan.

Though these sites see their task primarily as one of affirming a Sikh identity, the circulation of images of the tortured bodies of Sikhs on Internet at the height of the Khalistan movement demonized the Hindu other for the Sikhs, particularly those in the diaspora.

However, the articulation of a global *punjabiyat* may first be heard in the construction of a post 1984 Sikh diaspora, which reveals a slippage between ethnocultural and sectarian identifications. It heralded the affirmation of the older ethnolinguistic collectivity through similar linguistic returns on both sides of the border on the Indian subcontinent and the Punjabi diaspora. The cultural and linguistic revivals in the constitution of a Sikh diaspora made *punjabiyat* globally available to other Punjabi ethnicities, which seized the opportunity to stake their claims to the *punjabiyat* monopolized by *sikhi*. But the linguistic rupture affected by the nation-state and its administrative machinery and the role of the script in splitting Punjabi identity compels the community to reimagine itself in speech and nonverbal forms rather than in writing and literature. Punjabis write themselves back into *punjabiyat* by re-learning the forgotten speech through popular cultural forms circulated by the mass media.

Punjabi Pop: *Bend it Like Beckham*, *Monsoon Wedding*, *Bollywood Hollywood*

Punjabi ethnocultural and linguistic returns catalyzed by the Movement for Khalistan in the 80s enabled the recovery of the Punjabi speech community. This occurred through the appropriation of the shared Punjabi folk heritage in the construction of a Punjabi popular culture that has become a contested site entertaining competing claims to *punjabiyat*. The popular cultural space of film, television, music, fashion and food is an eclectic space, which makes room for Punjabis of all castes, classes, gender, geographical location and nationality. The Punjabi cultural revival may be traced to the mid-eighties and its repercussions may be felt both in the homeland and the diasporas. The visible Punjabi presence in popular culture, film, television and music plays a major role in destigmatizing Punjabi language, music, dance and culture. Punjabi self-representation in popular cultural genres deconstructs the stereotyped representations of Punjabis in Indian and British popular cultures for the consolidation of a Punjabi ethnicity. The virtual Punjabi nation converges on Punjabi or Punjabi inflected speech and the new electronic media of the television, film and cassette to construct a new Punjabi subject transcending all boundaries. Punjabi self-representations in media spaces exploit new communication technologies to construct Punjabi difference. It wrote a dissenting narrative in India's satellite technology program SITE (1975), designed to produce the compliant national subject. The Punjabi wave began in India on the state owned Doordarshan (DD), where it decentred state-directed strategies by vernacularizing Indian national television programming. The vernacularizing of the national language Hindi occurred in a media sponsored nostalgic return to the Indian independence saga. But two teleserials,[4] which retold the story of the Indian partition from the perspective of the Partition displaced, foregrounded the geographical, cultural, linguistic and physical violence of Partition to write their dissent to the upper-caste, Hindu dominated nation narrative. The Hindi dominated Indian popular cultural sphere was similarly vernacularized through the arrival of Punjabi music, which takes the film and television industry by storm. Meanwhile, British Punjabis had been deconstructing blackness by returning to Punjabi rusticity to isolate Asianness from it. The twin Punjabi returns in the nation and the diaspora intersected in the transnational space constructed by deregulation in India and the entry of transnational television channels, film and internet. By the nineties, the combined synergy of television, film, phones, cassettes, computers enabled the construction of a global *punjabiyat* in an economy of circulation in which geographical location becomes redundant.

Bhangra: Apache Indian, Bally Sagoo, Punjabi MC

The globalization of Bhangra, the shared Punjabi harvest ritual, has been enabled by the links provided by ICT between folk artists and the Punjabi diaspora overseas and transnational music companies. Folk artists like Gurdas Mann, Hans Raj Hans, Malkit Singh, Pammi Bail and popular "stars" like Daler Mehndi have successfully appropriated ICT to globalize Punjabi music through their tie ups with British-Punjabi artists such as Bally Sagoo and Apache Indian and music companies based in the UK. The interdependence of the ICT, Web sites,

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television channels, email, mobile phones, has reduced the distance from UK to Punjab to such an extent that Bhangra "stars" shuttle as frequently between Birmingham and Ludhiana as between Ludhiana and Mumbai.

The images of the dancing Bhangra body, circulated through transnational mediascapes across the globe, recovers in the visual spaces of television and film the undivided Punjabi body before its compound fractures. The images of the body in pleasure in Punjabi music and dance, superimposed on the pictures of burnt, bleeding, broken Punjabi bodies witnessed during the Indian Partition of 1947 and the Sikh movement in the eighties, recover the traces of the unbroken, undivided Punjabi body. This organic body is constructed through an agrarian ethic of labour and pleasure. The images of the body in motion, rather than script or language, circulated through the new nonverbal media, become the site for the imagining of a global *punjabiyat* erasing all dividing lines.

ICT AND RECOVERY OF SELF

Thus, the virtual return of *punjabiyat* displaces modern cartographic representation of Punjab with postmodern telemetric simulation to recover the traces of preimperial, prenational Punjabi interconnected spaces, which enabled tenancies of identity in multiple, nonconflictual spaces. The displacement of territorial with telemetric organization of space leads to the disintegration of the Euclidian world of discrete nation-states by invoking the terrestriality of the old Punjabi place. Global Punjab, imagined in cyberspace, by converging on the images of the body in dance, music and everyday practices, proves that "physical location and physical territory, for so long the only grid on which cultural difference could be mapped need to replaced by multiple grids that enable us to see that connection and contiguity vary considerably by factors such as class, gender, race, and sexuality" (Gupta & Ferguson, 1997).

The global *punjabiyat* paradoxically returns to the prenational, preimperial regional memory buried under the national masternarrative to constitute itself. Bill Ashcroft's statement that place becomes more important as it becomes least spatial, fits in perfectly here. The constructions of *punjabiyat* in hyperreality invoke the "myth of return" in a feeble attempt to compensate for the permanent loss of place. The new imaginings of *punjabiyat* are responses to the various experience of displacement that has been the destiny of the Punjabi community for several reasons: migration, partition, and globalization.

The global *punjabiyat* constituted in cyberspace ironically recovers the materiality of space by invoking the undivided Punjabi bioregional memory, releasing it from the national boundaries that have bifurcated it since the Partition. Punjabi replacement in imaginary places is predicated on living-in-place self-narratives of a positively inflected rusticity. Though Punjabi displacement has been both literal and metaphorical, metaphors of replacement in language and culture serve to compensate for the impossibility of geographical return or relocation. Recovery of language and culture, in the face of the impossibility of return, point a way to the recovery of the self.

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KEY TERMS

Bhangra: Punjabi harvest ritual, which has hybridized with reggae, rap and hiphop, to become Asian dance music in Britain.

Palimpsest: a manuscript (usually written on papyrus or parchment) on which more than one text has been written with the earlier writing incompletely erased and still visible www.cogsci.princeton.edu/cgi-bin/webwn. Jose Rabasa used the metaphor to describe geography's reinscription of space.

Partition: The Partition of the Indian subcontinent in 1947 at the end of British rule that resulted in the formation of India and Pakistan and displaced six million people.

Punjab: a state, situated in the northwest of India, it is bordered by Pakistan on the west, the Indian states of Jammu and Kashmir on the north, Himachal Pradesh on its northeast and Haryana and Rajasthan to its south". Undivided Punjab included present Pakistan Punjab.

Punjabiyat: Punjabiness

Retribalization Marshal McLuhan in "The Constellation of Marconi": Electronic media-starting with the electronic telegraph, so, strictly speaking, it should be the "Constellation of Morse"-are helping us to **retribalize** in a global village, where our senses become fully involved once again (and the written word loses its old prominence and power over us).

Sikh: Disciple. Although you can be a Sikh (learner) of anything/anyone, this word has been adopted by the followers of Guru Naanak Dev Jee's philosophy to donate themselves as the SIKHS-students of Guru. www.singhsabha.com/Gurbaani%20Dictionary.htm

ENDNOTES

1. *Apna* means ours in Punjabi. It is also the acronym for an association of Punjabis in the U.S.

2. "The Punjab occupies the northeastern portion of the Indo-Gangetic Plain and is surrounded by the Himalayan Mountains to the northwest and the Hindu Kush to the north. The Yamuna River marks the eastern extent of the Punjab while the Sulaiman Range marks its western extent". This description of Punjab is another example of geographical imperialism, the kind perpetuated by the division of the globe into natural or cultural regions. These data are distributed by the EROS Data Center Distributed Active Archive Center (EDC-DAAC), located at the U.S. Geological Survey's EROS Data Center in Sioux Falls, SD. *Global Perspectives: A Remote Sensing and World Issues Site* http://www.cet.edu/earthinfo/sasia/punjab/PJtopic1.html, 28th April 2004

3. The official Web site of the Government of Punjab, India defines it as "situated in the northwest of India, it is bordered by Pakistan on the west, the Indian states of Jammu and Kashmir on the north, Himachal Pradesh on its northeast and Haryana and Rajasthan to its south".

4. *Tamas*, based on noted Hindi novelist Bhisham Sahni's novel of the same name, deals with the violence in run up to the Indian Partition foregrounding Hindu nationalism's occlusions in writing the Indian nation subject. Ramesh Sippy's *Buniyaad* documents the history of the transformation of the Punjabi subject into the Indian subject by following the journey of a Partition displaced Hindu family. Sippy's *Buniyaad* vernacularizes Hindi by using a Punjabi inflected Hindi used by Punjabi speakers.

Impact of PFnet Services on Sustainable Rural Development

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OVERVIEW of PFnet PROJECT

PFnet in the Solomon Islands is the first attempt to introduce rural e-mail stations in remote rural villages in isolated islands. It was established in 2001 under an UNDP-UNOPS project and was initially partly funded by UNDP. Since then the major funding has come from Japan, NZODA, Britain, Republic of China, AusAid and European Union (Leeming, 2003a). It is managed by the Rural Development Volunteer Association (RDVA), a registered NGO. PFnet has an Internet Café (head office) in Honiara, the capital city and operates a network hub with fourteen rural e-mail stations linked by HF (short-wave) radios with e-mails typed in a laptop and powered by solar energy (Stork, Leeming, and Biliki, 2003). PFnet provides for the information and communication needs of the rural people. It is a source of information (e.g., providing news, Internet access), source of communication (sending and receiving e-mails), and provider of typing, secretarial, and printing services. PFnet has been a success story in improving the information and communication needs of the rural people (Leeming, 2003b).

PFnet has three interdependent pillars. One is a public access point in Honiara, the capital city. This Internet Café allows residents to exchange e-mails with stations across the Solomon Islands or the wider Internet. They can also browse the World Wide Web or post their own information to share with others (Stork, 2004a). The Café also serves as a training facility for a number of rural development stakeholders and the broader public. A second pillar of PFnet is a development portal, providing developmental information and facilitating the flow of trusted news between communities (Leeming, 2003c). This has proven to be an important aspect of peace building in a nation torn by ethnic conflict between 2000-2003. The third and, ultimately, the most important component of PFnet is the network of rural e-mail stations located on remote islands across the country. The stations are usually hosted in provincial health clinics, community schools, or other accessible and secure public facilities. E-mail operators help customers send and re-

ceive e-mails and provide other services at a nominal cost (Stork, 2004b).

PFnet is based on the concept of community ownership (grassroot people) at the village level with three partners: PFnet committee chosen from village people, PFnet Operator, and PFnet management based in Hoinara. The model of community leadership and operation was formulated and piloted to ensure grassroots ownership, community empowerment, and the security of facilities and equipment. The model was successfully applied to all PFnet rural e-mail stations. The model operates as follows:

- Awareness of an e-mail station project is raised among the community and a village management committee is established in accordance with the cultural context.[2] The committee chooses the location of facilities and station operators and is responsible for the effective operation of PFnet station.
- A three-way agreement is signed between the committee, operators and PFnet, defining the roles of each party (including technical support, maintenance, security, and ownership), as well as the sharing of revenues (with incentives for the operators and committees and the setting up of a maintenance fund).
- Champions and local experts are identified among potential users with e-mail awareness and needs, and are expected to initiate other members of the community to e-mail services, and provide locally available technical backstopping. Their support is usually rewarded with a free e-mail account.

AIM OF THE RESEARCH

The research was designed with two main aims (with minor aims within each main aim). The first main aim was to find out the extent of access and utilisation of the PFnet services in the Solomon Islands. Within this broad aim the following research questions were examined:

- What are the main issues affecting community uptake and appropriation of services?
- Why only 20-25% of the users of the e-mail stations are women? What are the reasons for this? What are the recommendations to increase women's participation?
- What are the principal factors underlying differences in utilization amongst the e-mail stations?
- What are the information needs of differing groups (women, the elderly, farmers, students, entrepreneurs and business people, etc.) in the e-mail stations?
- Why do certain e-mail stations generate more revenue than others?
- What are the significant descriptors (and primary interactions) of a rural e-mail station and a user community?
- What is the optimum spread of the network and where can additional sites be located to best effect?

The second main aim was to find out the impact of the PFnet services on "sustainable rural development." Within this broad aim the following research questions were examined:

- Has the PFnet project improved the livelihoods of people in PFnet project communities? If so how?
- What groups in these communities have benefited most? Which groups have benefited the least?
- Has the PFnet project in PFnet project communities contributed to:
  - Environmental awareness and sustainable resource management and/or
  - Improved gender equality in PFnet project communities, if so how? And/or
  - Improved well-being (including health and security) for people in PFnet project communities?
  - Peace building and reconciliation?
- In what ways have any improvements to livelihoods, environmental awareness, gender equality and well-being been sustained?
- Has the PFnet project been able to increase awareness of the use of ICT's as an enabler for Development at the policy and decision makers' level in the Solomon Islands? If so how? Has the PFnet project stimulated the activity at the policy level in the Solomon Islands?
- What linkages to other projects (focusing on Japanese funded projects in light of the Japanese funding for PFnet/PFnet replica) and new initiatives can be considered for the future?

RESEARCH METHODOLOGY

This study was designed as a sociological study of PFnet stations and both quantitative and qualitative research methods were utilised to gather data. Quantitative methods are useful in revealing the extent of differences between groups and can provide a sense of space for qualitative methods. On one hand, the data collected through quantitative methods is often seen as being more authoritative, and therefore more likely to be taken seriously by relevant high-level policy makers (Bryman, 2001). Quantitative methods were useful in revealing the extent of differences between groups and can provide a sense of space for qualitative methods. On the other hand, qualitative research methods have the ability to reveal the complexities of human arrangements. It can be applied in ways that provide the opportunity for deriving a great deal of "rich data," thus revealing a comprehensive understanding of the real issues that are operating in a village or society and in this way, help to place the situation under study in a broader context (Coffey & Atkinson, 1996).

Quantitative Research Methods

Four quantitative sets of data were collected for the research.

Primary Base-Line Survey

First, a primary base-line survey was conducted to collect data from a wide range of respondents in the Solomon Islands.

Research Instruments for the Survey

A structured questionnaire was the main research instrument used to conduct the survey. Five different sets of questionnaires were designed and used for the survey. Questionnaire one was used to gather information from people who "use" or "ever-used" PFnet services. A second questionnaire was used to gather information from people who "never-used" PFnet services. Third questionnaire was used to gather information from "operators" at each of the PFnet stations. Fourth questionnaire was used to gather information from "committee members" of at each of the PFnet stations. Finally the fifth questionnaire was used to gather information from "focus group meetings."

Pilot Testing of Questionnaire and Training of Research Assistants

The questionnaires were pilot tested by Solomon Island post-graduate students at USP and five researchers assis-

tant in the Solomon Islands to assess relevance of the questions, iron out problems and assess the cultural appropriateness of the survey questions.

Sample of PFnet Station Researched

A sample of five PFnet stations out of a total of 14 stations were selected. Only the community-based rather than commercial-orientated PFnet stations were chosen. The sample comprised of two very remote and three relatively remote stations. The stations that were chosen were Hutuna station, Pirupiru station, Sasamungga station, Sigana station, and Silolo station.

Sample Size for the Respondents for the Survey

A total of 538 respondents were interviewed from villages within the radius of five miles from the station. In each station we selected nearby villages, remote villages and very remote villages. The sample included members from all relevant groups in the community including, women, young people, and the elderly and key respondents such as community leaders.

Conducting Actual Fieldwork

A lead researcher and a research assistant visited each of the five stations. The lead researcher together with the research assistant conducted the fieldwork for a week—namely conducting interviews, doing focus group meetings, and talking to key informants. The lead researchers conducted fieldwork for one week and the research assistants continued the fieldwork for another seven weeks.

Data Analysis

SPSS software programme was used to analysis quantitative data.

User-ILog Data Captured for Eight Weeks During the Research Period

Second, we gathered data on users of PFnet services in each of the five stations during eight weeks when we conducted the fieldwork. The user logs captured the number of users of each of the five rural e-mail stations studied. The operators of each station maintained a user log with entries for the usage tally of unique users, with their gender and home village. From this, the percent of users in villages at different distances were calculated. The village populations were obtained or estimated from the census

Table 1. Sample size for survey

Types of Respondents	Number (N)
People who currently use or ever used Pfnet services (Q1)	251
People who never used PFnet services (Q2)	261
Committee members of PFnet stations (Q5)	21
Operators at PFnet stations (Q3)	5
Total	**538**

records directly and from census data reported by the Solomon Islands Development Administration and Participatory Planning Program (SIDAPP) and from GIS-based data from the 1999 census.

User-Log Data from PFnet Monitoring System (Jan 2003-March 2004)

Third, Monitoring System User Log Data collected by PFnet headquarters is used. The monitoring data is from the reports from the five researched stations researched, over 15 months since January 2003-March 2004. The monitoring system captures user profiles and reasons for using the facilities. Every day, all rural e-mail stations record in a "Sales Log" all PFnet service transactions that are made. In particular, customer e-mails sent are logged with the user profile (age group, gender, and education level) and e-mail details (destination, main purpose). This is non-specific user information as the name and identity is not logged. At the end of each day, the operator enters the day's data into a database application, which outputs the information as a text file, which is then e-mailed to the PFnet headquarters in Honiara. The Webmaster in Honiara imports them into a central database. Thus, daily usage data is accurately and efficiently collected without waste of bandwidth. The data from e-mails sent out (not incoming) is of sufficient sample size to be a significant measure of the user profiles and usage patterns. This data is complementary to the user log information above, which was recorded to capture the number and profile of unique users, and give an idea of the distribution of users for each station. Although the day's takings are recorded in the daily reports, the operators are also asked to produce a monthly summary report manually. This can be checked against the daily reports if necessary.

Data from Socio-Economic Profile of Each Station

Fourth, data from an socio-economic profile of each station was complied and was used in the results section. These profiles were done before the fieldwork in order to give researchers some background information about

each station and missing gaps in these profiles were updated during the actual fieldwork stage.

Qualitative Research Methods

Interviews with key informants and focus group interviews were conducted to gather qualitative data. The key informants included, national and provincial government officials, rural development officers, policy makers, village leaders, etc. In addition, 20 focus group meetings were conducted (four in each of the five PFnet stations). These qualitative research methods were useful in revealing in-depth rich data.

SUMMARY OF MAIN RESEARCH FINDINGS

The research findings are reported in two parts. Part one discusses the results relating to the aim one of the studies, which was to examine the extent of access and utilisation of the PFnet services in the Solomon Islands. Part two discusses the impact of the PFnet services on "sustainable rural development." For both parts, all sources of data gathered are used, namely: quantitative results from the main surveys, interviews of committee members, interviews with the PFnet station operators, interview of key informants, the "user-log data" captured over two months of research, the PFnet monitoring, and data from focus group meetings.

Results on Utilisation of PFnet Services

The major research findings with regards to utilisation are as follows. First, the data shows that the population density, distribution and how accessible a station is to people has an effect on the utilisation of the PFnet facilities. The user log results show that most of the users live within a few kilometers of the e-mail station. Around 32% of the users live less than one kilometer from their respective PFnet stations. Hence the data generally indicates that the communities living near the vicinity of the e-mail station are mostly enjoying the benefits. But at the same time, all stations recorded a significant number of users from well beyond the local village community.

Second, the results show that the location of the e-mail station within the type of a building within a village and sense of ownership (whether it is privately or community owned) has an effect on the utilisation of the PFnet facilities. For example, there is a lack of a sense of community ownership of the facility at Silolo PFnet station because it is housed in AusAid project office and some people think it belongs to AusAid project rather than a

community-owned project. The overall result shows that only around half (48%) of the respondents knew that PFnet is a "Community owned NGO project in partnership with government."

Third, there is a correlation between the degree of dispersion and diaspora of people within and outside the Solomon Islands and the utilisation of the PFnet services. For example, Hutuna station has a high proportion of overseas e-mail communication because a greater percentage of people from Hutuna have migrated overseas.

Fourth, cost of the PFnet communication service is not a dominant factor in their utilisation. A very high proportion (97%) of the users indicated that the prices for sending and receiving email were "reasonable," "cheap" or "very cheap." This clearly indicates that cost is not a hindrance for use of PFnet services.

Fifth, awareness of the existence of PFnet stations and its services has impact on utilisation. Awareness is one of the key factors in whether a community utilises PFnet services. The results show that 63% of "user-group" and 72% of "non-user-group" respondents knew of the PFnet stations through friends, family and wider kinship.

Sixth, the research findings show that around 31% of women use PFnet services. More specifically, the result shows that Hutuna has the highest percentage of women users (with 42%) followed by Pirupiru with 35% and Sasamungga with 31%. The lowest participation was in Silolo (19%) and Sigana (16%).

Seventh, the research finding from the user-log data that shows the highest users (20%) were in the age bracket 40-44 years. The second highest group (18%) was in the age bracket 35-39 years. In all five stations the highest users were those in their thirties and forties, except in Hutuna station, the highest users were those in their fifties.

Eighth, a high proportion (93%) the "user-group" respondents understand the main purpose of the existence of PFnet stations, which is to "provide faster, cheaper and easier communication for rural people and to improve rural communication services."

Ninth, a very high proportion (99%) indicated that they use mainly e-mail services, 29% use it "to get news" and 27% use it for "typing services." As a majority of the respondents use the stations to send and receive e-mails, this indicates that PFnet stations are fulfilling their objectives in providing the villagers with contact to the outside world via e-mail.

Results on the Impact on Sustainable Rural Development

The major impact on sustainable rural development are as follows.

The first major impact of PFnet is that it provides quick, affordable, and sustainable communications to rural people (to around 85% of the 450,000 population) where no commercial penetration of communication services has yet been possible beyond the nine provincial towns. For example, PFNet helped raise people's awareness on global events and news, raise awareness of people's human rights and has enabled people to know about weather news during cyclones, and disaster management times.

The second major impact has created new opportunities in education as well as led to the improvement and enhancement of the existing educational needs of rural people. For example, in Sasamungga "distance education trials" were held and this proved to be successful (Patson, Taniveke, Leeming, Agassi and Biliki, 2002).

The third major impact of PFnet has led to the creation of new economic and business activities and enhanced existing businesses in remote rural areas. PFnet has enhanced business in areas of fisheries, forestry, seaweed projects, and agriculture. One example is the emergence of the national NGO known as Kastom Gaden Association, which caters for small-scale farmers to sell their produce. Another example is the creation of Solomon Seaweed Company Ltd, a new company which exports seaweed to Japan. Agents for this company are based in each rural seaweed location and they are given private PFnet e-mail accounts and training in communication. This seaweed project is linked through the network to an Online Business Information Service (OBIS), which supplies technical and market information to entrepreneurs and is operated by the Ministry of Commerce[3]. This seaweed company also was featured in the BBC World Service Trust/UNDP/UNESCO Go Digital series[4]. With the upcoming UNDP PFnet replication project in Vanuatu and Bougainville, explicit activities to increase the number of economic opportunities in rural areas will be implemented[5].

Fourth, PFnet assists several sustainable livelihood programs. These include the Rural Fisheries Enterprise Project and its follow up seaweed farming programme. These EU-funded programmes have identified rural communication as a vital component and have arranged to fund PFnet e-mail stations at each of the programme sites.

Fifth, the PFNet project has contributed to environmental awareness and sustainable resource management in areas such as, forestry, illegal logging, fisheries, RFEP, small business enterprises, seaweed project, agriculture, Kastom Gaden Association, and taro diseases.

Sixth, PFnet project has improved gender equity and contributed to the following: improved voice for women, better communication and networking, more access to opportunities and career development awareness of networking, and awareness about news in the world.

Seventh, PFnet has contributed towards security, peace building and reconciliation. This was one of the major reasons why PFnet was established in the first place (Leeming and Biliki, 2003). PFNet was to be able to provide objective and accurate information on the facts during and after the ethnic conflict in the Solomon Islands. PFnet assisted in reducing the number of false rumors and misinformation. Furthermore, currently it is assisting in peace building and the reconciliation process by providing objective information through its news service and access to other independent news sources both nationally and internationally.

Eighth, PFnet has increased awareness at the policy and decision-maker level of the use of Information and Communications Technologies (ICTs) as an enabler for development, and driven activity at the policy level in the Solomon Islands. PFnet has started an ICT for development dynamic to provide communications between its grassroots activities and the national decision-makers working on the national ICT Policy and Strategy[6]. Furthermore, it has mobilized the donor community and its development partners, who have funded the project and are now proactive in expanding its applications on both the grassroots and national policy level. For example, the United Nations project in the Ysabel Province for "Integrated Development"[7] intends to establish three rural e-mail stations in one province as part of a rural e-government component. The UNDP Pacific sub-regional e-Pacifika project[8], which facilitates development of national ICT Policies and Strategies, makes use of the rural e-mail stations to gather inputs from people and organizations from the rural areas for the Solomon Islands National ICT Policy and Strategic plan.

Tenth, PFnet has contributed to the health sector as health workers have taken advantage of PFnet services to communicate with medical personnel at the main hospital in Honiara with regards to patients' diagnosis of illness and appropriate medication. All the five e-mails stations have rural clinics nearby within 10km.

Eleventh, PFnet has improved the living standards of some people in remote rural areas. the creation of new "economic/business activities" and enhancement of "existing businesses" has improved (though slight for some people) living standards of some people in remote rural areas. PFnet helped people in their career opportunities, for example, rural people have used PFnet services to check for vacancy, do their CV and apply for jobs. Directly PFnet has created jobs for rural e-mail operators in each of the communities where it is present.

Twelfth, PFnet has contributed toward enhancing effective governance. For example, it has contributed to communication between central and provincial government, improved awareness of the rural people about central government operations, and enhanced knowledge of rural people in matters of provincial government.

Thirteenth, PFnet has contributed towards enhancing NGO activities. The PFnet services have benefited rural NGOs such as community organisations and church organisations.

Fourteenth, PFnet has enabled politicians to use PFnet to inform people in their constituency about central and provincial government policies, activities, projects, and issues affecting their constituency area. This flow of information can help rural people to be aware of central and provincial government activities, which was hard to know previously.

Finally PFnet lead to capacity building of a number of groups of people. One, rural people get to know basic facts about information technology by using the PFnet e-mail stations, learn about computer skills, typing, printing, the Internet and news. They have some idea how PFNet operates. Two, operators get trained in basic computer information and communication skills. Three, committee members at each of the station get trained.

- Capacity was increased of staff at the Honiara PFNet headquarters.

In summary, PFnet project has benefited the following groups in the communities:

- Women
- Young and old people
- Health workers
- Education workers
- Business people
- Church workers
- Local government
- Police
- People in tourism sector

PROBLEMS OF PFnet STATIONS: LESSONS TO BE LEARNED

Although, the research results show that overall the PFnet services has been a success story, there are some minor teething problems that needs to be rectified to further enhance the ICT services in the Solomon Islands. Some of the problems were as follows: first the research finding shows that the PFnet Committees at the PFnet stations were not functioning adequately. This is an area that needs some work from PFnet Management based in Honiara and an issue to remember for those who are thinking of replicating PFnet project in Vanuatu and PNG. Secondly, there are some problems associated with the work done by operators. A high proportion (87%) of user-respondents indicated that station operators were doing their jobs properly, however, a small proportion had some

complaints. Thirdly, the fear of personal and confidential matters being revealed by operators is one of the things that is affecting the uptake slightly. Finally, at times there are some technical problems with PF net services and they include: computer not working properly, radio (via which message is sent) not working properly and delay in receiving the messages.

CONCLUSION

PFnet has been a success story. It has made a tremendous impact on rural people. PFnet is providing the avenue for people to upgrade their opportunities, career path, standard of living, etc. Businesses and small village-based enterprises including commodity and retail are benefiting from the e-mail. It has had a pioneering impact on rural development in the Solomon Islands in contrast to other type of rural development projects that have been taken by national government or by international donor agencies.

Awareness is a key factor in whether a community utilises an e-mail station. It is recommended that awareness raising and demonstration of the facilities to potential user groups should be held in all the nearby communities. This is even more essential if the site of a station is away from a village centre. Open days in Honiara have proved to be an effective means of introducing people to the service and driving the uptake in the village. However, the benefits of Internet-based communications are perhaps not being made clear enough to the potential users. More training and demonstration of information access should be planned by PFnet to address this, especially for special interest groups and in the more isolated stations.

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KEY TERMS

HF: High Frequency or Shrot Wave radiok operating in 3-22 MHz range

ICT: Information and Communication Technology

JICA: Japanese International Cooperation Agency

NERRDP: National Economic Recover, Reform and Development Plan

PFnet: People First Network

RDVA: Rural Development Volunteer Association

RRRT: Regional Rights Resource Team

USP: University of the South Pacific

UNDP: United Nations Development Programme

ENDNOTES

[1] We would like to mention that during our research on ICT in the Solomon Islands we collected a lot of data. This paper provides only a summary of the major findings. Over the next six months more detailed analysis on specific areas would be done and we hope to publish them periodically.

[2] This context, in the Solomon Islands, is often characterized by little social-economic differentiation

but religious and kinship (wontok) divisions. The setting of the committee necessarily needs to reflect these divisions, understanding various interests within the community and ensuring a fair representation of all parties.

[3] See http://www.commerce.gov.sb/IRS/Online_ Business_Information_Service_OBIS.htm for the OBIS Web site.

[4] See http://www.bbc.co.uk/worldservice/trust/ projectsindepth/story/2004/07/040715_ digitalpacific.shtml for more information.

[5] See http://www.undp.org.fj/Strenghtening_ Community_Access_to_Information.htm for more information.

[6] See UNDP, 2001, Creating a Development Dynamic – Final Report of the Digital Opportunity Initiative, July 2001. Accenture, Markle Foundation and the UNDP.

[7] See http://www.peoplefirst.net.sb/nirdp/ irdp_un.htm for more information.

[8] See www.undp.org.fj/RAS064.htm for more information on e-Pacifika.

Implementation of a Health Information Systems Programme

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E-GOVERNANCE AND ICT: PROBLEMS AND PROSPECTS

In general, developed countries in the world is where Information and Communications Technology (ICT) is in an advanced state, governments in developing countries particularly in the Asia- Pacific region are only in the initial phases of adopting ICT. ICT has demonstrated benefits for governments in developing countries to improve management, information and reporting, streamline the delivery of government services, enhance communication with the citizenry, and serve as a catalyst for empowering citizens to interact with the government. The United Nations Development Programme (UNDP, 2001) considers that ICT is a useful tool for developing countries to progress and leapfrog to the applications applied in the developed world**.** The Indian draft report on ICT and Human Development records that in the 21st century there is large growth and diversification of the ICT sector in India particularly in areas of agriculture and in service sectors (UNDP, 2004). The United Nations even has an ICT advisory group with representatives from governments of developing countries and the industry (Singh, 2001).

The International Bank for Reconstruction and Development (IBRD) and the World Bank group are pursuing the objectives of improving economic conditions by application of information systems and framing policies to accelerate the process of integration of NII (National Information Infrastructure) with GII (Global information Infrastructure), further focusing on strategies to enhance human development. Consensus is almost emerging amongst the developing countries for preparing national strategies to participate effectively in the information society (Bajwa, 2001).

While there are a lot of potential benefits by e-government in terms of supporting public sector reform and poverty reduction, not many examples can be cited in the Asia-Pacific region where these benefits have materialized.

Analysts point out a number of potential benefits and pitfalls of adopting e-government. Heeks (2001), for example, gives many instances of managerial reforms supported by ICT, including improving effectiveness and efficiency of personnel management, parts procurement, accounting, health care, and claiming unemployment benefits. At the same time there are many authors like Salazar, Ranerup, Benjamin and West (2001) who point out that expected benefits are often blocked by managerial and technical difficulties, and insufficient attention to the information needs of communities.

Also in bureaucratic settings that exist in many developing countries with limited technical capacity, authoritarian decision making and strong patron - client relations may fail to produce the hoped for results (Berman and Tettey, 2001). Until there is a demonstrated example of e-government with tangible benefits, it will be difficult to progress (Dutton, 1996). Progress can only be made in delivering the ICT-enabled reforms that can yield many benefits, provided that government officers and people are willing to share information.

ICT IN INDIA

In India**,** the path towards technology-induced development, especially associated with ICT, was given a vent in 1984 under the leadership of Rajiv Gandhi. He assumed power and adopted informatization of Indian society as an effective route to development, with a massive programme of computerization launched in the public sectors as well in the commercial undertakings and administrative departments. The computer policy of 1984 gave further thrust to software development by underlining the need for institutional and policy support on a number of fronts (Joseph, 2002). Again in 1986 an explicit policy was announced identifying software as one of the key sectors in India's agenda for export promotion and underlining the importance of an integrated development of software for the domestic and export markets. In the same year, the Department of Education (DoE) established ERNET (Education and Research Network), as one of the earliest Internet projects. These initiatives suggest that a significant beginning had been made in setting new ICT priorities and organizational development in different sectors.

Since the mid-1990's India has also embarked on ICT for development in a rather big way and sought to transform India into what has been termed as "Knowledge

Superpower" (another variant of the Knowledge Society). An IT Taskforce and an IT Action Plan from Planning Commission and MIT respectively are major policy initiatives towards this end. Even though India has been able to establish considerable ICT national capacity in the context of market-oriented globalization, the same cannot be said about India's ICT capacity for addressing pressing needs and demands of the underprivileged sections. It also emerges that the role of individual state leadership in proactively using ICT for development, also tends to strengthen a system of a market economy (Bajwa, 2001). By 1999, a separate Ministry of Information Technology was created and in May 2000 the Information Technology Bill was passed in Indian Parliament to foster widespread use of ICT in the day-to-day lives of the people.

In any major policy initiative that induces a dramatic social change, the state normally is expected to play the role of the initiator, mediator, facilitator and arbitrator. The Indian state has played a major role in the context of ICT for development from the early 1980's at various levels. Even in the networked age, national domestic policy still matters and the policies devised at the centre provided a favourable climate for the states within India to take a proactive role in the growth of ICT industry. Apart from encouraging investments and exports, these policies focus on the key issues of infrastructure, electronic governance, ICT education and providing a facilitating environment for increasing ICT proliferation in the respective states.

ICT INITIATIVES IN ANDHRA PRADESH

Andhra Pradesh (AP) is one such state in India where different ICT initiatives support the desired national policy. MPHS (Multi-Purpose Household Survey), CARD (Computerization of public administration functions), Video conferencing, TWINS (a single window service for integrated services to citizens under the title "e-seva") and APSWAN (A wide area network to connect the secretariat), CICs (Community Information Centres) were given support to progress faster than otherwise would have been the case. In a relatively short period the state had been in the news for its innovative approach to designing and implementing an ICT-enabled strategy for e-governance and as well for bringing about an ICT-enabled social transformation. These different ICT-enabled initiatives were mainly aimed toward poverty alleviation among the poorest areas and in the marginalised in the rural areas (where 80% of the AP population lives), providing them with ICT resources in an attempt to link them to the global information network. Also the State ICT policy emphasises

application and *use* of ICT. The aim is to enable that the common citizen starts using ICT applications in ways that benefit themselves. In short, the Andhra Pradesh government's aim was to enable localised technological learning by using ICT, which will in turn over a period of time provide the potential for ICT innovations and local entrepreneurships to develop.

It is within this broad framework and environment for change through e-governance policy and implementation, that this articles briefly describes an ongoing empirical project called the Health Information Systems Programme (HISP). It relates to the implementation of information systems for improved local control and use of information at district and sub-district levels in the health sector in Andhra Pradesh. This article later describes the challenges that the team faced in sustaining the implementation of HISP in AP.

Keeping the background briefly outlined above as a backdrop and taking in account the state government's priority for health and education in the existing sagging public health care network, the introduction of the HISP in AP was considered timely and appropriate.

CONTEXT FOR IMPLEMENTATION OF HEALTH INFORMATION SYSTEMS PROGRAMME (HISP)

Health Policy in Brief

The initial decades after independence in India saw the launching of many new ventures in the health sector. However, over a period there emerged a complaisance in the Health Department which led to the introduction of a new health policy in 1983. This had a view to promote Preventive, Promotive and Rehabilitative health care and also to shift the focus from medicare to health care and from urban to rural, as 70% of population in India lives in rural areas. Both the Government of India and State government made large investments in the development of Primary Health Centres (PHCs). But their operation and sustainability left much to be desired as staff largely worked in isolation in hierarchical ways with no feedback on information that was collected and collated in huge volumes.

HMIS in India and Andhra Pradesh in Particular

Ranganayakulu Bodavala (2001) in his report on Health Management Information Systems (Vital Statistics) and Geographical Information Systems (GIS)—Structure, Prac-

tices, Issues and Strategies for Development, stated that Bhore reportedly as early as 1943-46 identified the necessity of a sound information system as a support to the various developmental activities of the health sector in India. The National Health Policy of India (1983) inter alia states that appropriate decision making and programme planning in the health and related fields is not possible without establishing an effective HMIS. It recommended that a nationwide organization should be established to procure essential health information, which may provide support for the local management of health care and effective decentralization of activities. The National Health Information Systems provide the inputs in the formulation of regional and global health policies.

THE HMIS DEVELOPMENT IN INDIA AND THE ISSUES AT EACH PHASE OF DEVELOPMENT

Some of the main initiatives pertaining to development of HMIS and how they could not be rolled out are now outlined. As early as 1972, efforts were made to introduce Integrated Management Information and Evaluation Systems by the Central Bureau of Health Intelligence and this scheme could not get started because each state followed its own formats of reporting.

And ten years later, the National Health Policy envisaged a nation-wide organization to procure essential health information. Hence, between 1983-85 HMIS version 1.0 and with the help of WHO and National Informatics Centre (NIC) HMIS version 2.0 were developed and tested out in four participating states (Gujarat, Haryana, Maharashtra and Rajasthan) to develop standardized formats, reports and registers to be used by sub-centres and PHCs. Based on the success of these implementation efforts it was decided to roll out this new system in 13 sates and union territories in a phased manner.

But the system suffered inadequate implementation, as there was apathy from the users at all levels to demand, validate and utilise information for decision-making and feedback.

In 1998-99, the Indian Government conducted facilities survey, rapid household surveys in all districts as part of building HMIS in RCH programmes. But since the assignment was given to the third-party consultants, they were not completed in time and as a result most of the states did not receive the valuable data in time. As a result, no database was developed nor shared with the state governments who were the real users of the data and so the reports remained in paper format (Ranganayakulu Bodavala, 2001).

Problems in PHCS

There were constant problems with the PHCs, including the lack of access by the community to the PHCs. This happened because of poor planning at the state level, regular absenteeism of medical officers, poor infrastructure, shortage of staff and drugs, lack of financial resources, irregular power supply and other amenities. Except for making the field staff attend routine camps to train them on how to motivate ECs for sterilizations, there were no attempts at all to equip them with additional technological skills, develop a culture of use of information, or enhance their capacity in decision making at the PHC level. The health staff at the cutting-edge level in providing care was marginalized.

Work Culture Before Implementation of HISP

There is insurmountable pressure on the field staff to collect and collate routine data and send this to various departments in the health sector. This pressure has led to poor quality, and the duplication and fragmentation of data at the cost of neglecting essential services to the community. There was little or absolutely no feedback from the higher authorities to the field staff on the data collected and this created a situation of isolation. Over a period, PHCs further deteriorated and the concept of providing essential services to the community based on practical, scientifically sound and socially acceptable methods was lost. Again complaisance was built into the system. Soon PHCs became a synonym for doing sterilizations and just providing basic care for minor ailments.

Introducing HISP

It is in this context that HISP was introduced in Kuppam, the political constituency of the ruling head of the state. This was a small geographical area and it was easy to obtain support from Chief Minister's office, district and at the local levels. Further, there were only 9 PHCs spread over five mandals in the above locale leading to easy implementation.

The main objective of our project was to strengthen information practices within the Primary Health Care (PHC) sector with the larger aim of improving processes concerning health care delivery for the rural community. The initial months were spent in trying to understand the complex and multi-level flows of health information from the rural community to the department in state head quarters through the intermediary layers of the PHCs and District Offices (see Figure 1).

Figure 1. Flow chart depicting the fragmented data flowing to various deparments in the health sector in AP (Braa et al., 2001)
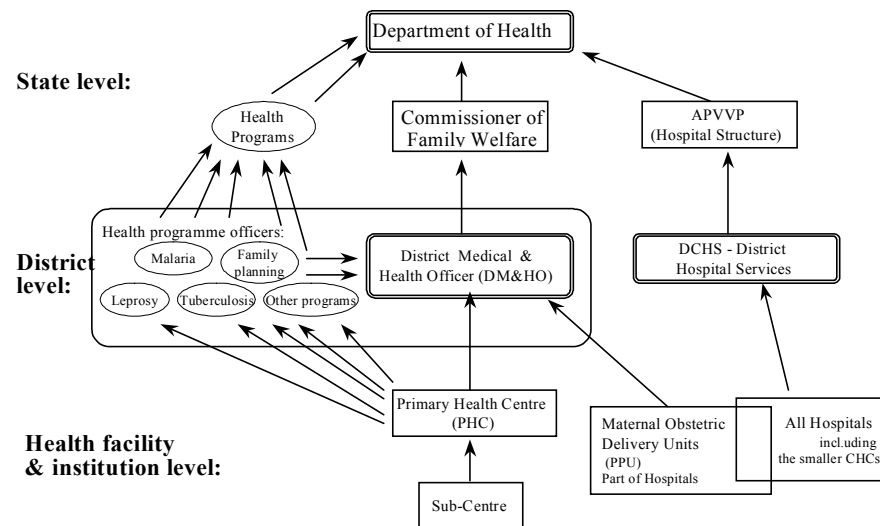
OVERVIEW OF HEALTH STRUCTURE

Strategies Adopted for Transforming HIS

Different strategies were adopted to provide training to health staff, both on using computers (thus leading to computerization of the 9 PHCs within Kuppam) and in building capacity amongst health workers for dealing with health information and enabling a culture of "use of information."

Surprisingly, in a short span of time most of the health workers quickly grasped the knowledge of using computers and DHIS software for doing data entry and doing simple analysis to monitor both individual and as well institutional performance in relation to the targets and indicators set by the higher authorities.

Once the authorities at the district and at the state were convinced of the use of computers, the use of DHIIS software and the quick technical skills gained by the health staff, orders were issued from the Commissioner of the Family Welfare Department to commence using reports generated using the DHIS software in the place of using manual reports.

The reports produced by DHIS are generally quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organization. They differ depending on the requirements of the organization.

Challenges

Little did the health staff realise that generating reports using DHIS software would bring to the fore the stark realities of manipulation of data in the PHCs that had been going on for years. Many of the staff in the PHC justified their manipulation of data against the unreasonable targets that were fixed by management that did not take into consideration the actual field situation. Other staff mutely accepted the situation to save themselves from the wrath of being punished and humiliated. Most of them looked for loopholes in the existing systems where the figures could be changed automatically while the reports were being printed to be submitted to the district officials. To avoid the pressures exerted both by the project team and the officials, some staff in few PHCs went to the extent of developing similar formats in MS Excel sheets and printed these reports with the required figures. However, these were easily identified by the HISP project personnel.

Question of Sustainability

After more than a year of effort in making the DHIS implementation for improved information systems successful in the midst of tackling all the political complexities, there was suddenly a big dilemma amongst the health staff in the PHCs as to whether to use the HISP system or to revert back to old practice of using manual reports. The manual reports were time consuming, delivered a lot of duplication and wasted the efforts of health staff. Some staff wanted to look for loopholes in the systems so that

the practice of manual manipulation of data could be continued. This attracted illogical increases in the ouptut targets from distant management that did not understand local realities

ANALYSIS

While from the project and officials' perspective, it has been considered that the HISP systems have been stabilised and routines established, the attempts by the health staff to revert back to the old approach of information systems has been a challenge.

At this point it is useful to discuss whether the project has considered HISP as technical system and relegated the behavioural and organisational issues to a secondary level or even to be not considered at all. As suggested by Walsham et al. (1998) that "this complex interlinking can best be addressed by conceptualising computer-based information systems as social systems in which technology is only one of the elements."

While HISP's main objectives were to strengthen information practices within the Primary Health Care (PHC) sector with the larger aim to improve processes concerning health care delivery for the rural community, attempts were made to understand the internal information structure and the flows at various levels. But the real problem in the adoption by the PHCs, where the project was implemented, was based on the targets set by higher management without taking into consideration the local realities and in not consulting staff at the grassroot level.

So attempts to improve the HISP or capacity building of the health staff by providing training on computers never really improved the situation as the main problem was related to the targets and the hierarchical structures.

While more efforts were focused on building the capacity of health workers through providing training on both computers and use of information, the weakest link in the adoption chain was at the district and the state levels.

Generally it is considered important from a project implementation perspective for a "bottom-up" approach. In this case a lot of energy and time were spent with the health workers at the community level providing training on computers and District Health Information Systems software, on improving data quality, to analyze and make use of information. However, in evalution it became apparent that equal and in fact more effort had to be spent at the level where decisions were taken and thrust upon the field-level functionaries. More time should have been spent with officials at the higher echelons of management in highlighting the problems of data quality, targets, importance of feedback, ensuring an active involvement

at every stage from planning to implementation and demanding an assessment to create and sustain local participation and ownership of project activities.

So, in a country like India where hierarchy and bureaucratic structures are strong, it is important to target a change in the organizational and hierarchical structures. During the process of the implementation of any ICT initiative, it is necesarry to give importance to both technical and organizational issues, since organizational issues play a crucial role in making any implementation a success.

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KEY TERMS

E-Government: E-government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, and more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions (World Bank, 2004).

Health Information Systems: A Health Information System (HIS) is a process whereby health data (input) are recorded, stored, retrieved and processed for decision-making (output). Decision-making broadly includes managerial aspects such as the planning, organizing and control of health care facilities at the national, state and institution levels. It also includes clinical aspects which can be subdivided into: (i) providing optimal patient care, (ii) training of medical personnel to generate appropriate human resources, and (iii) facilitating research and development activities in various fields of medicine (Ranganayakulu, 2001).

ICT: ICT is defined as encompassing all those technologies that enable the handling of information and facilitate different forms of communications among human actors, between human beings and electronic systems, and among electronic systems. These technologies can be sub-divided into capturing, storage, processing, communications and display technologies (Hamelink, 1997).

Implementation: Putting a system, process, or practice into operation (www.risnews.com/Glossary/glossary.html). The specific steps taken when attempting to reach a specific goal, is known as implementation (www.nonprofitbasics.org/TopicAreaGlossary.aspx).

Performance Indicators: In health care settings, these can be defined as statistics or other units of information which reflect, directly or indirectly, the performance of the health care system in maintaining or increasing the well-being of its target population (Boyce, 2002).

Primary Health Care: This is a health systems policy model adopted by the World Health Organization and the United Nations. The policy model identifies structures (general practitioners, community nurses, pharmacists, social workers and other health providers, local government, nongovernment, public, private sector and also citizens) that support health principles (collaborative networking, partnerships between sectoral and inter-sectoral cooperation) for advancing health and a set of claims about the effectiveness of the policy model to improve health (Nikolakis, 2000).

Sustainability: This has been defined in many ways and in the context of the health sector it has been defined as ensuring that our actions and decisions today do not inhibit the opportunities of future generations (http://www.doerr.org/html/Sustain.html).

ENDNOTES

[1]   Primary Health Centres have been referred to as PHCs in this article.

[2]   Empirical data collected while doing action research both as a researcher and as Project Coordinator implementing Health Information Systems project in Andhra Pradesh. The case study presented in this article is authentic and this article has not been published earlier in any other journal or presented at any conference.

Improving Electronic Information Literacy in West African Higher Education

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INTRODUCTION

Electronic information literacy has gained increased importance with the advent of the new information and communication technologies which, driven by the convergence of computers and telecommunications media, are crucial for facilitating, supporting, and enhancing learning and for the knowledge-based economy of the future. In "Africa's Information Society Initiative (AISI): An Action Framework to Build Africa's Information and Communication Infrastructure," African ICT experts appointed by the Economic Commission for Africa (ECA), have described the potential of the Internet to improve learning in higher education and established the foundation for this to become a reality in Sub-Saharan Africa. The AISI document that the group of experts produced was adopted by the ECA Conference of Ministers as the African Information Society Initiative (AISI) in 1996. The document calls for the implementation of communication infrastructure plans that would be integrated into higher education in the following ways:

a. providing equitable access to technological resources for distance education;
b. strengthening local educational capacity;
c. connecting schools, universities, and research centers to national and international distance education facilities, national and international databases, libraries, research laboratories, and computing facilities;
d. reducing communications and administrative costs by building communications networks linking all educational establishments;
e. promoting and supporting collaboration among teachers and researchers; and
f. extending the reach of educational facilities in informal learning, especially to community level (ECA, 1999, p. 4).

Information literacy has been defined as a set of abilities to "recognize when information is needed and have the ability to locate, evaluate, and use needed information effectively" (Rader, 2002, p. 2). There are extremely few electronic information-literate scholars including administrators, faculty members, and students on campuses in Sub-Saharan West Africa because this part of the world has only marginally benefited from the explosion of the information and communication technologies. For instance, in its 1999 Human Development Report, the United Nations Development Programme (UNDP) found that developing countries suffer from the most serious infectious diseases. Yet they often have the least access to information to combat them. The information and communication technologies would deliver critical knowledge to information-poor hospitals (UNDP, 1999, p. 59). Concurrently, these technologies can bring critical knowledge and information to schools, colleges, and universities.

STATE OF DIFFUSION OF INFORMATION TECHNOLOGY AND INFORMATION LITERACY

The information revolution has enabled academic institutions to provide a more flexible and open learning environment for scholars. For higher education institutions in Sub-Saharan Africa, the information and communication technologies represent an important opportunity for revitalizing higher education. They can provide a way for academics to overcome their isolation (Useem, 1999). As a result, there is a concerted effort to solve the problem of information technology access and its utilization in higher education institutions. In the 1994 Statement of Ouagadougou, Burkina Faso, administrators, academics, and researchers have identified implementation strategies to develop and improve Internet access and use. Suggested strategies include the promotion the use of electronic communication technologies, the setup of required equipment for faculty in every discipline, the improvement of links between organizations, and the coordination of action (Renaud, 1994).

Although there is now growing recognition of the far-reaching impact of the new information and communica-

tion technologies on learning, a number of issues continue to restrict its diffusion through public higher education institutions in Sub-Saharan African countries. Many of the scholars and administrators who want and need to use information technology have low ICT literacy levels. The shortage of financial and human resources, the lack of knowledge on the availability of potential tools, the insufficient telecommunications infrastructure, and rapid changes in technology are all contributing to this issue (Ali-Dinar, 1996). The greatest obstacle to use of information technology is not its acceptance as a tool in education, but how this tool will be acquired. Additional challenges for users in higher education institutions include lack of training to use technology features and services, follow-up, and continuity in utilization. Furthermore, educational and training facilities to help administrators, faculty members, and students become literate and acquire the proper skills are insufficient at most institutions (Odera, et al., 1996). A survey by the Association of African Universities (AAU) in 1998 found that only 52 of the 232 academic and research institutions had full Internet connectivity, while the remaining 180 institutions had access that was deemed inadequate (Useem, 1999). Consequently, the higher education community in Sub-Saharan West Africa lacks skills in areas including systems analysis, programming, maintenance and consulting, and at all operational levels that negatively affect their productivity.

Higher education, largely state and public-supported, is not only allocated decreasing appropriations but is also affected by the roaming influence of under-developed telecommunications infrastructure and limited available equipment. The state of higher education indicates and continues to reflect the levels of socio-economic status and policy making in the majority of the countries.

CHALLENGES TO ICT AND INFORMATION LITERACY IN SUB-SAHARAN WEST AFRICA

The major obstacles to widespread information technology access and literacy improvement include limited telecommunications infrastructure, cost of information technology equipment, and lack of support and expertise.

Telecommunications Infrastructure

The insufficiency of telecommunications infrastructure is expressed in abundant statistical information, available both in print and on the World Wide Web. Joyce-Hasham

(2001) reported that less than 5% of the world's population was online, more than 80% of the world's population had never heard a dial tone, and fewer than 2% were connected to the Internet. Elliot (2000) noted that Sub-Saharan West Africa had 12% of the world's population but just 2% of its telephone lines. Two of the major reasons for the sluggishness in infrastructure development are financial and political (African Development Forum, 2000). Political decisions failed to bring telecommunications services into rural areas, where more than 75% of the population lives. The existing telecommunications infrastructure is not adequate to sustain a reliance on distance education as a principal method for improving and expanding higher education. Low bandwidth is a limitation experienced by higher education institutions.

Costs

Costs for ICT access in Sub-Saharan West Africa are out of reach for the majority of people. Burnheim (1999, p. 4) stated the following about the use of the Internet:

Its outreach is largely confined to an educated and affluent elite living in the major cities. In many countries where local calls cost for Internet use for example upwards of U.S. $4 per hour (in some countries as high as $10 per hour).

In addition, inefficiency and lack of customer service and user support are major factors that affect access and costs.

Technology Support and Expertise

Maintaining, repairing existing equipment, and software troubleshooting are major challenges, especially in rural areas where skilled information technology technicians are scarce or non-existent. Jensen (1999) reported that many computers are old and poorly maintained and found that support and training for technology use are under-funded. Numerous computers are not repaired and therefore remain unused, and available equipment is under-utilized due to illiteracy and lack of skills.

EQUITY OF OPPORTUNITY ON CAMPUSES

While current level of ICT use might appear low, it represents a considerable increase over just a few years ago (Useem, 1999). Some countries have raced to establish the Internet on campuses. These campuses were the van-

guard of information technology developments, and most of them provide all Internet services today. The French-speaking countries have a higher profile on the Internet and greater institutional connectivity than the non-French-speaking countries. This is largely due to the strong assistance provided by the various Francophone support agencies and the Canadian and French governments, whose assistance was designed to balance the dominance of the English language on the Internet.

While a number of higher education institutions have established distance education departments, the delivery platform to date has been text and correspondence-based supported by print material. Among the institutions that are currently using the Internet, some are beginning to explore video-conferencing and other forms of multi-media (Association for the Development of Education in Africa, 1999). For instance, the FORST program links Benin and three other countries with McGill University in Canada. The Réseau Africain de Formation a Distance (RESAFAD), or the African Network for Distance Education program in Benin, Burkina Faso, Guinea, Mali, Mauritania, Sénégal, and Togo, provides teacher training from French universities. The most ambitious distance education initiative on the continent to date is the African Virtual University (AVU) Project. This is the first satellite-based attempt to harness the power of information technologies to deliver university education in the disciplines of science and engineering, non-credit/continuing education programs, and remedial instruction to students in Sub-Saharan Africa. The AVU project was designed to deliver instructional programs, strengthen the capacity in African partner institutions, implement a network infrastructure, and implement a digital library program. The AVU Project plans for five Anglophone and five Francophone African countries to be linked in the initial pilot phase. Another virtual university program supported by the Agence de la Francophonie, or the Francophone Agency, is the Université Francophone Virtuelle or the Francophone Virtual University (Darkwa and Mazibuko, 2000). These programs address many concerns relative to technology and information literacy and skills.

Regardless of the linguistic difference, the interest in information literacy has been spurred by systematic transformation of education at all levels, and the adoption of information technology in higher education is increasing. Politicians and scholars are working to integrate the ICT into curricula to achieve relevant learning outcomes and augment electronic information literacy. User education in electronic information literacy has become an area of research, and most institutions of higher education are involved in activities in that area (Rader, 2002).

STRATEGIES FOR IMPROVING ICT LITERACY IN HIGHER EDUCATION

The combination of information and communication technologies infrastructure, weak policy and regulatory frameworks, and limited human resources has resulted in inadequate access to affordable telephones, broadcasting, computers, and the Internet. As a result, Sub-Saharan African countries have been unable to capitalize on information technology as a tool for enhancing livelihoods and creating new business and learning opportunities. Cross-border linkages at national, regional, and global levels have been constrained. In order to bring about change, the New Partnership for Africa's Development (NEPAD) has set the following objectives:

a. to double teledensity to two lines per 100 people by 2005, with an adequate level of access for households;
b. to lower the cost and improve reliability of service;
c. to achieve e-readiness for all countries in Africa;
d. to develop and produce a pool of information and communication technology-proficient youth and students from which Africa can draw trainee information and communication technology engineers, programmers, and software developers; and
e. to develop local content software, based specifically on Africa's cultural legacy (NEPAD, 2001).

Even though the applications of information technology in higher education in Sub-Saharan West Africa have been severely underused and a lower level of information literacy still persists, there was tremendous improvement during the first years of the 21st century. Several studies have indicated that issues of access and quality should be addressed. Kinyanjui (2004) has emphasized a number of areas, including teacher or faculty development, math, science and technology, quality of elementary education, and access to tertiary education. The key priorities are to develop information and communication technologies infrastructure across the African continent and to develop skills in a critical mass of the population.

ICT literature is available to help find, select, and implement the best strategies to improve ICT in Sub-Saharan West Africa. The most significant point identified is that the absence of ongoing training, professional development, and adequate administrative support for technology negatively impact Internet use in colleges and universities in emerging countries.

Ongoing Training

Training has been found to be a key factor in promoting technology use. Providing faculty, staff, and students with needed skills to operate computers and use new applications is a necessary ingredient in Internet use. Yet, training is often the most underfunded item in an institution's technology budget.

Professional Development

Faculty, staff, and students need continual training in order to make technology applicable, and useful to them and to increase their performance. As a result, the provision of professional development activities will improve administration, teaching, and learning and contributes to achieving colleges' and universities' missions.

Administrative Support

Effective strategic planning and flexible processes in setting priorities according to the institution's mission and resources allocation to meet institutional objectives, are key components of successful implementation of ICT. Decision makers and administrators must find ways to acquire computers and provide training, support, and incentives that encourage technology use. In order for effective information and communication technologies use to occur and the electronic information literacy to be integrated at institutions of higher education in Sub-Saharan West Africa, the following must occur:

Providing Strong Leadership for Change

Campus officials must provide the strong leadership required to effectively bring about technological change. Without leadership and a strong sense of support for change in colleges and universities, the barriers affecting technology will remain. Leaders should implement tested methods for strategic planning that lead to technological change on a reasonable schedule, tested methods for generating the needed support, and for successful ways of financing technology.

Developing a Shared Campus Vision

Developing a shared vision concerning the value and future impact of information and communications technologies is important. It is critical for campus opinion leaders, decision makers, and other important stakeholders to understand and agree that a shared vision is

necessary and that it must be the guiding force behind campus planning and resulting strategy.

Building Consensus through a Campus-Wide Strategic Plan

In addition to a shared vision, a written strategic plan for information and communications technologies that is understood and embraced by all must be employed. All key stakeholders must see the Internet (including the campus network) as an integral part of the institution's information and communication-based resources. Institutional leaders must nurture this consensus and build on it to generate the funding and human resources necessary to effectively integrate the Internet into all aspects of the campus information and communications infrastructure.

Institutions of higher education must create effective organizations that address all aspects of human and technical support for information and communications technologies. This information technology organization must establish and implement a computer-use support system and training campus-wide. The structure of the information technology organization encompasses a mix of centralized and decentralized strategies to support constituencies on campus. For instance, colleges and universities can establish a pyramid of support that offers both decentralized and centralized consultation for more complex issues.

Implementing Faculty and Staff Development and Training

In this time of rapid changes in ICT, faculty and staff development is increasingly recognized as a key factor in enabling their successful use of computer and Internet technologies. At the institutional level, there must be a strong commitment to faculty and staff development and the provision of ongoing organizational support and training.

Building Partnerships and Fostering Inter-Institutional Collaboration

Campus leaders must take the initiative in establishing and promoting institutional partnerships and collaboration at the community, regional, national, and international level. The purpose of partnerships should be to exchange experiences and learn from each other, facilitate exchange of students and staff, conduct joint research, implement network-based applications, and/or share the cost of joint course development and delivery. A campus can join or even form a regional network,

actively participate in relevant national organizations, and involve an ever-wider circle of its opinion-leaders in developing a shared vision of networking for higher education.

CONCLUSION

How should Sub-Saharan West African higher education institutions develop or improve electronic information literacy in the absence of or with limited information and communication technologies? Accessibility to the new information technology is still the major challenge in Sub-Saharan West African countries and, specifically, in higher education institutions. Meanwhile, scholars need training for effective new information technology use in order to function productively in work, social, and learning environments. Higher education institutions should provide leadership in learning and in training future citizens. Effective information and communication technologies integration and literacy will require a commitment from administrators and the full participation of faculty members and students.

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KEY TERMS

Centralized Strategies: A managerial approach through which support for information technology use for all constituencies is provided by a single on-campus structure.

Cross-Border Linkage: An active connection, relation, or association between two or more institutions separated by a geographic distance or boundary.

Decentralized Strategies: The structure of the information technology organization encompassing supporting units that are located at the school or college level.

Diffusion: The act of a higher education institution using information, professional relationships, and structured methods to incorporate an innovation into learning, research, and administration, bringing about new integrated system-wide change.

E-Readiness: The state of being prepared to operate and utilize electronic technology.

Information Literacy: An ability that has been acquired by training to locate, understand, evaluate, and use needed data efficiently and effectively.

Institutional Connectivity: Refers to an organization or institution's ability to link with others' networks and the rate at which this connection is made.

Stakeholders: A group of individuals or organizations who has a share or interest in the successful outcome of the establishment and sustainability of an enterprise.

Strategic Plan: A formulation of an organization or institution's scheme or program for the accomplishment, enactment, or attainment of essential goals within a specified period of time.

Teledensity: The number of telephone lines per 100 inhabitants in a given geographic area.

Industry–Relevant Smart Community Partnerships

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THE REGIONAL COMMUNITY OF LOGAN CITY

Logan City (population of 400,000) is Queensland's third largest city and one of the fastest growing in Australia. The population is expected to grow to almost 500,000 by 2011 (Logan City Council, 2001). Other characteristics of the region include its relatively young population profile, and the higher than average proportions of persons from low socio-economic and non-English speaking backgrounds who live in some areas of the region. Further, unemployment rates tend to be high in parts of the region and higher education participation rates are low. Economic activity tends to be based in small and medium business and light industry. The employment profile of the region has a lower proportion of professionals, managers and administrators than the rest of Queensland. Overall, the regional profile has a higher proportion of tradespersons, clerks, plant and machinery operators, and sales and personal services workers than state averages.

A COMMUNITY CAMPUS

Griffith Logan is a community campus with over 2,600 students. Its creation in 1998 was driven by the regional community. The campus was planned and developed by involving and listening to the regional population. The students at Griffith Logan largely come from the Logan region. The close links that the campus and its broader community are building together are another special strength. The links are extensive and range from practical work experience for students, regional development, partnerships and links with schools. All degrees are offered in on-campus flexible learning mode. Flexible learning is an approach that seeks to provide choice and options for the learner, using campus and home access to the Internet and packaged subject resources

(Baskin, Barker & Woods, 2003). The approach retains student-staff and student-student on-campus interaction, and suits many students who are unable to take full-time study due to family, work and other commitments. Most class activities are scheduled during the daytime, except in the part-time business, management and commerce courses.

From the beginning Logan was, and still is, at the cutting edge of innovation in student-centred learning and educational delivery. The emphasis on flexible learning-the massive investment in technology and learning resource development-will always be a feature of Griffith Logan. Flexible learning at Logan has attracted substantial national and international interest and the approaches developed at Logan are being adopted at other campuses of Griffith University. One outstanding feature of this approach was that it was compulsory for each course at Logan to have a Web site that would be integral to the teaching of the course. Another feature was the encouragement to incorporate student-centred learning in course design and development by giving students greater choice, access, flexibility and responsibility for their learning through innovative teaching.

THE TEACHING AND LEARNING BUSINESS INDEX (TALBI)

The community-wide Teaching and Learning Business Index (TALBI) is an electronic action learning (Zuber-Skerritt, 1996; Bourner & Flowers, 1999; Limerick, Passfield & Cunnington, 1994) index and database that can be used by businesses, educators, students and researchers to integrate local industry more closely with learning and research programs at Griffith University. In doing so, it provides a practical focus to learning and skill development within a community and practitioner context (Limerick, Passfield & Cunnington, 1994). At present, access to TALBI is via Griffith University's

School of Management Web site, and the Web sites for the individual organisational development and management courses that use TALBI.

The index has three components-a business database, profiles of participating businesses, and an archive of the Executive Summaries of past students' organisational development projects. The business database provides a searchable index of the businesses operating within the Logan district, based on the Business Register, compiled by the Logan Regional Economic Development Board.

Featured within the profiles of participating businesses are descriptions of organisations interested in acting as business mentors, along with study contacts and their areas for involvement and expertise. The archive of student projects contains past student fieldwork projects and research endeavors undertaken within local organisations on topical business issues. When a new cohort of students starts the process of trying to find an organisational site to undertake their applied management project, they read the Executive Summaries of the projects that other students have completed in a particular organisation. In this way, they can build on previous work, and so avoid "reinventing the wheel" in an organisation. If possible, new students make contact with students who conducted the project and gain their experience of having interacted with the personnel of the business they wish to contact. Practitioners in local businesses, most of which are small businesses, appreciate that they do not have to orient students to aspects of the business that can be read about on the database. Further, it is more likely that organisations will benefit from the students' involvement because the new project is developed in the context of previous projects.

The database is used in a number of courses focusing on organisational development, with the primary focus being the "Applied Management Project," a third-year undergraduate management subject where students conduct a group research project within a chosen organisation. A subsequent third-year undergraduate management subject called "The Reflective Practitioner," requires students to return to their project organisations to review the success or otherwise of their project. An introductory first-year management subject, a second-year management decision-making subject, and operations management courses also uses the index (Barker, Woods & Baskin, in press).

THE POTENTIAL OF THE SMART COMMUNITY-FUTURE TRENDS

The Smart Community initiative offers the potential to enhance the professional, social, cultural and economic development of Management Students by offering access to "situated learning experiences" in a way that embeds and blends academic study and practical workplace experience in an ICT-mediated framework. The challenge of the past has been to blend theory and practice in management studies, to produce graduates with the experience, profile and skill-sets that industry both seeks and values. This has been the warrant for practice in Management Education, and in times past, would have relied upon a regulatory or professional body generating guidelines to standardise management education practices. In New Zealand, where the accreditation process effectively involves the New Zealand

Figure 1. The networked smart community
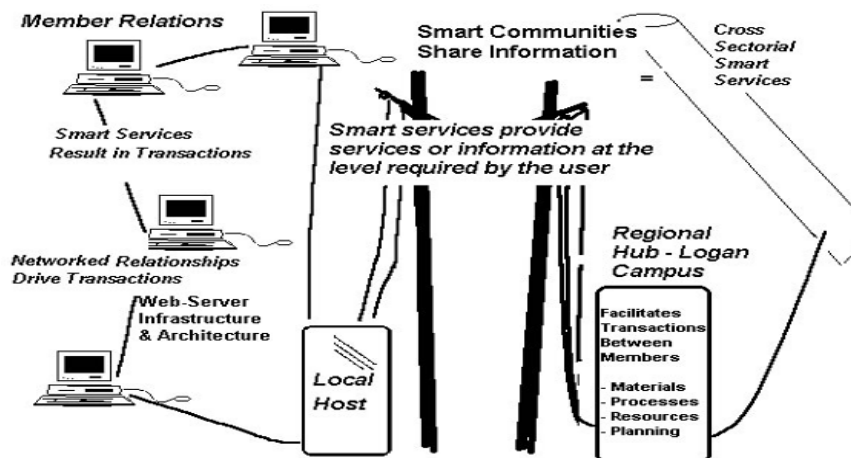
Institute of Management (NZIM) in such a role, this is not an uncommon scenario. In Australia however, no regulatory or broadly recognised accrediting body exists. In lieu of a driving body, management educators must look to the commercial sector and enlist the power of commodification in order to shift existing practices towards industry standards. This requires a radical break with established norms, and opens the way for new practices, relations and new learning partnerships.

Smart communities by necessity enlist the potential of an advanced communication and information infrastructure. In the case of the university, this was more of a tailored architecture than it was a standard ICT infrastructure. To be "smart," the use of technology must be interactive or must lead to a transaction, that is, online activity must be more than a passive act. The key elements of this smart community are:

- **Technology:** the ICT tools that facilitate smart community interactions.
- **Digital Content:** the building material.
- **Networked Relationships:** the common interests that bind, compel or unite the smart community.
- **Interactive or Transactional applications:** the processes that give smart communities a purpose.

Far from being the typical learning environment, the smart community involves a complete re-engineering of the traditional concept of community. In order to make the shift to new "rhythms" of teaching and learning, academic staff in the host school had to adopt a unified, locally determined but interlinked learning community (Figure 1) (Baskin, Barker & Woods, 2003). This meant

developing school-based "smart learning" architecture including:

- An effective information/innovation interface-the TALBI database as a regional hub provided materials, processes, resources and planning capabilities. Connected to industry partners via Web-based platforms, member relations included networked transacting to initiate cross-sector projects between students, academics and local organisations.
- An effective peer education process-industry-based mentoring using ICTs. As smart communities share and develop knowledge networks, cross-sectorial smart services emerge to deliver "smart" services at the level required by each user.
- The capability to self-educate long after the formal education process has been completed. Because member relations are archived, organisational memory and institutional experience are embedded in the knowledge repository of the community. As this archive expands, so too does the community grow smarter.

In a management context, TALBI delivered very clear transactional applications. For students it meant access to demonstrable skills and experience, to academic staff it meant access to potential consultancies and grant partners, and to industry partners it meant access to possible and cost-effective industry solutions. It is this commonality of purpose that gives the "smart community" its heuristic appeal.

Figure 2. Action learning in the smart community
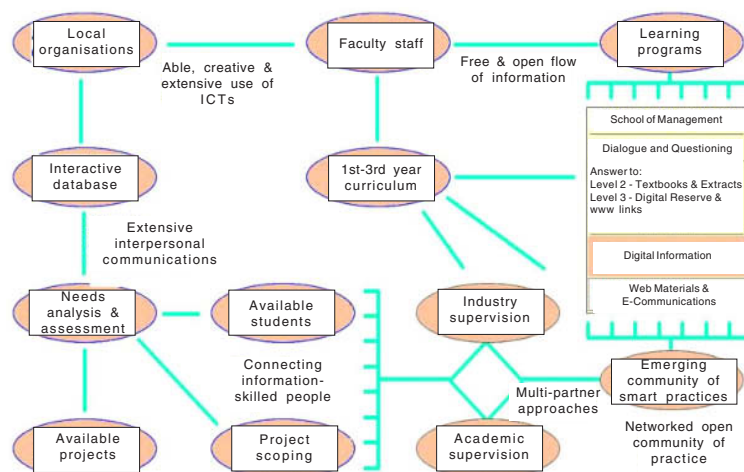
THE SMART COMMUNITY:
AN ACTION LEARNING APPROACH

Australian universities are taking varied approaches to the use of ICT in learning (DETYA, 2000), including "Web enhancing" and/or "Web mounting" existing materials, or packaging learning materials aimed at economising delivery costs (e.g., Lambier, 2002; Kearsley, 2002; Blasi & Heinecke, 2000). Less emphasis has been placed on the redevelopment of learning approaches to take full advantage of new and emerging technologies. The "smart community" model focuses on action learning and action research processes.

The smart community (Figure 2) is animated by the free and open flow of information between faculty staff, students and local organisations. The main features of this model include:

- The school curriculum informs its learning programs. Industry partners subscribe to the TALBI database, and through able, creative and extensive use of ICTs engage in a simple needs analysis and assessment before determining student fit, and subsequent placements.
- Extensive use of advanced digital information and communications technologies leads to a scoping of each industry project. A matching of student, academic supervisor and project scoping for best "fit" ensues.
- The connectedness of information-skilled people to one another is facilitated through extensive interpersonal communications, leading to collaborative multi-partner approaches in a networked community of practice (Wenger, 1998).

Given the figures (Figure 1 and Figure 2 respectively), the smart community model can only be relevant where services result in member transactions. To the Management School, this means course content must lead to transactions. Put simply, our curriculum needs to be relevant to the industry and community we purport to serve. In this context, a transaction is defined as a series of Web-based interactions that result in the completion of a process. A transaction is therefore more than interactivity-it is outcomes-based. For example, being able to make an appointment with a local doctor (GP) is a service to the community. On the other hand, being able to view his/her appointment schedules online, and make an advance booking in the process is a transaction, or a "smart" service. Such are the ways in which management students are able to create new "value" within the local community.

As an adjunct to and corollary of this, in the smart community it is the nature of relationships that drive transactions. In the Smart Community, information is freely and openly shared, although with the caveat of anonymity and confidentiality in relation to organisational projects. The TALBI database carries an archive of sample projects, and is accessed via a simple search engine that enables users to interrogate existing project outcomes, as well as core organisational data from would-be-host institutions. A climate of openness and collaborative process-based learning frames the relations of the Smart Community (Vogel & Klassen, 2001). The TALBI database is the organising resource in this smart community. It is the structuring resource for matching student and organisation, learner and organisational mentor, learner and academic mentor, academic and organisational mentors, and student and project profiles. In this way, Smart Communities can be seen to facilitate community transactions and interactions by providing smart services or information at the level required by each user, at the appropriate information level, in the context of service detail that is required by the user (Stein & Zwass, 1995). Given the technological orientation of the TALBI database, the smart services it generates are thus cross-sectorial, and have a currency that is not restricted by existing functional, organisational or jurisdictional borders.

The design and development of the TALBI portal gives the business students of the Logan campus, and the organisations of the Logan district, their own localism, their own regimes of competence, and even their own generational encounters. On the TALBI Web site, the student projects archive helps to preserve valuable information that is useful to a range of community members-similar businesses, market researchers, policy and decision-makers as well local planning and lobby groups. This organisational memory system (OMS) spans the Logan Business Community and "functions to provide a means by which knowledge from the past is brought to bear on present activities, thus resulting in increased levels of effectiveness" for the community (Stein & Zwass, 1995, p. 95).

The TALBI portal facilitates deep transformative experiences that involve new dimensions of identification and negotiability, new forms of membership and multi-membership by locating students in a broader community of relational practice. The TALBI portal, and the Smart Community Model present a way to use the Web in a collaborative teaching and learning environment to open trajectories of participation and innovation to all community members (Celsi & Wolfinbarger, 2001).

MAINTAINING THE COMMUNITY

The sustainability and effectiveness of the smart community face a number of challenges. These challenges include the currency of the TALBI database, the sustainability of community relationships in a constantly changing environment, and the need to bring community participants together in face-to-face interactions.

As a hub connecting students, academic staff and industry partners, the TALBI database contains information that requires continuous updating. The database of 3,500 industry partners was particularly fluid, and a common frustration of student participants was that the contact information was often out-of-date. To solve this problem, network partners needed to be able to update their information online by themselves, and the local regional business network and university academics needed to invest resources to ensure that information on the database was current and correct. A biannual update of the database helped to maintain its relevance.

The maintenance of relationships between network partners also required an ongoing commitment of time, energy and resources. Some industry partners were not satisfied with the projects completed by students in their businesses. Academic staff sometimes had to repair or complete projects when industry partners were dissatisfied with outcomes. The communication between network partners was usually infrequent, and a regular newsletter to maintain the flow of information was identified as a partial solution to this problem.

CONCLUSION

A major process in making the smart community effective is building commitment to the community through face-to-face contact (Coe, Paquet & Roy, 2001). To help build commitment, the TALBI project brought together industry partners, academics and student participants in an event celebrating the completion of student projects. At the event, student groups would set up displays introducing their projects, and academics and industry partners would rate the students on their displays as part of student assessment. The celebratory emphasis and the possibility of business networking at the event, helped ensure a positive and continuing commitment of participants to the TALBI smart community. The creation of the TALBI database and Web site has successfully initiated industry-relevant community partnerships that benefit a wide range of regional stakeholders. The key challenge will be retaining the community commitment to effectively sustain the smart community.

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KEY TERMS

Action Learning: A practical and structured process focused on real organisational problems and the development of a case study describing the problem, including team-based research within an online environment. Action learning includes a continuous renewal process of reflective observation, abstract conceptualisation, active experimentation and concrete experience.

Architecture: A tailored interactive communications and information structure that leads to online transactions including the curriculum content, networked relationships, various applications, and outcomes.

Flexible Learning: A combination of varied teaching practices including applied research and investigative projects within a flexible learning mode that is aimed at maximizing learner engagement through action learning methodologies and advanced technologies. The key focus driving educational design is meeting the learners' needs.

Organisational Memory System (OMS): As with the human brain, OMS acts as a repository for data and accumulated intellectual knowledge. As the smart community grows, so does the community's memory (intelligence). It is expected that the infrastructure will support self-education long after the formal education process has been completed.

Partnerships: A group of stakeholders that have initiated and contribute to the effective ongoing operations of a "smart community," including community groups, business, government, educators, researchers, and students. Shared learning is a fundamental commitment of the total community.

Smart Community: The result of the ongoing development and maintenance of innovative joint ventures between a diverse range of regional stakeholders including community organisations, government, business, educators, researchers and students, where the exponential sum of all of the parts is ultimately of greater value than the previous outcomes. The electronic community network creates value and transforms the way a community lives, works and grows.

Information Communication for Child Development Service

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INTRODUCTION

Integrated Child Development Services (ICDS) is a comprehensive package of services for early childhood care and development, targeted to the poorest areas of the country. The government of India launched the most important, multi-faceted ICDS scheme in 1975 with the main aim of providing integrated pre-school education and nutrition for children (infants up to six years of age), nutrition and health education for women in the age group of 15-45 years. Through this scheme, women and children living below the poverty line scattered in various parts of the country were to be integrated through a common program aiming towards improved nutrition and health.

ICDS has been India's chief vehicle for improving the prospects for the healthy, physical, psychological and social growth of its children. The scheme, which was launched with 33 projects in 1975, increased to 2,907 projects by 1995 and to 5,652 projects by 2002.

The concept of reaching the most "unreached," the most vulnerable in society is the underlying philosophy of ICDS. Addressing the interrelated needs of young children, adolescent girls and women of disadvantaged community groups, ICDS is the only program which holistically addresses health, nutrition and development needs of young children, adolescent girls, pregnant women, and nursing mothers across the life cycle. It has emerged as the most effective program for breaking an inter-generational cycle of gender disparity by intervening as early as possible, to promote survival, growth and development, protection and participation of the yet to be born female child and adolescent girls. ICDS offers equal opportunities for early care, nutrition, health, and development to young female children, leading to enhanced active earning capacity and better school retention.

The focus on quality improvement includes a clear priority for addressing the more crucial prenatal, (children below three years of age) promotion of child survival, growth and development, an emphasis on decentralization and a focus on family/community-based interventions and communications for changing child care behav-

ior patterns. The ultimate aim of the ICDS program is to reduce Infant Mortality Rate and Maternal Mortality Rate.

Efficiency in the delivery of ICDS services is the key to the success of the program. The major components of ICDS include:

a.   Supplementary nutrition;
b.   Pre-school education;
c.   Immunization;
d.   Health check up;
e.   Referral services; and
f.   Nutrition and health education.

The basic unit of the ICDS system is the network of Anganwadi Centres (AWCs). These centres are the focal points of delivery of all basic services to women and children in the rural and urban poverty areas.

These AWCs are run by village volunteers, called Anganwadi workers (AWWs) and Anganwadi Helpers (AWH). Supervisors monitor the performance of these AWWs and AWHs. Each supervisor is generally assigned 17-25 AWCs depending on the total number of AWCs in the taluk and number of supervisors posted to that taluk. Each state is divided into several revenue districts. Each district is again classified into smaller revenue divisions called taluks. About 18 to 25 centers constitute a sector or a circle. Each supervisor would be in charge of one or two circles/sectors. These supervisors are to report their activities to Child Development Project Officers (CDPOs) who are the implementing authorities at the taluk level. CDPOs are in charge of all the AWCs in the taluk. CDPOs report to Deputy Director, Department of Women and Child Development (DWCD), which is the implementing authority at the District level. Deputy Directors, DWCD of the districts work under the instructions of a Joint Director and Director at the Head Office located in the state capital, Bangalore.

The article is an attempt to assess the existing status of information communication and technology in DWCD in general and ICDS in particular and suggest measures for improvement. The article is based on an empirical

study undertaken by the authors related to child development services in Karnataka'1. In the process of the study many distortions in communications, cases of delayed communications and missed information were observed. The very objectives of the scheme were not accurately communicated down the hierarchy and to the community, which the author feels is a stumbling block in the successful implementation of ICDS.

LITERATURE REVIEW

Various research efforts have contributed to an insight into the underpinnings of the program and helped in identifying bottlenecks/lacuna in the implementation of the schemes, poor delivery of services, inadequate supervision, poor community participation and limited role of ICDS supervisory staff. Studies by CHETANA (1989), Coonar and Mohan (1985), Phillips and Kurien (1986),

Nutrition Foundation of India (1988) and National Institute for Public Cooperation and Child Development (NIPCCD, 1988) identified constraint in mobilizing a community for active participation as the main lacuna of ICDS functionaries (especially AWWs). An evaluation of early childhood care and development by UNICEF revealed that early childhood care and education was an important program for retention in primary school. The UNICEF study team suggested the linkage of early childhood care and education with ICDS.

The NIPCCD (1992) study considered a sample of 100 ICDS projects covering 98 districts in 25 states and one Union Territory. The sample included 54 rural centres, 18 urban centres and 28 tribal centres. Using a multi-stage random sampling technique for selecting AWCs, interview and observation methods were used for collecting information pertaining to delivery of services at AWCs. NCAER[8] for its All India Study considered 4,000 operational blocks, spread over 32 states and Union Territories. For the Karnataka Study, NCAER considered 10% of total AWCs in the state. A census of all operational blocks was conducted. Followed by this, one circle from each block (under one supervisor) was considered, thus selecting 15 AWCs and three beneficiary households per AWC.

Social Assessment Study of Bundlekhand considered three districts, while that of Eastern Uttar Pradesh considered six districts. For both of the studies, two villages each in two blocks of each district were considered. Major methods used in these studies included informal surveys, participatory techniques (social mapping, wealth ranking, venn diagrams) and formal surveys. A two-day joint orientation-cum-planning workshop for resource persons and ICDS functionaries was conducted prior to the fieldwork.

The Indian Institute of Rural Management, with the aim of obtaining World Bank assistance, conducted the Knowledge Attitude and Practice Study in three ICDS covered districts and one district not covered by ICDS. The study adopted multi-method approach involving Participatory Rural Appraisal techniques, focus group discussions, structured personal interview schedules and observation of AWCs.

All these studies have mainly suggested:

a.   Upgrading of AWW's skill through continuing in-service training.
b.   Strengthening inter- and intra-departmental (sectoral) coordination.
c.   Mobilizing community support and participation
d.   Upgrading physical infrastructural facilities at AWCs.
e.   Strengthening the capabilities of grassroots functionaries through a new approach of continuing training. This training needs to be designed to strengthen the services of the ICDS package and improve its quality.

ONGOING STUDY

Social assessment is developed as a tool for project planners to understand how it will affect and is affected by development intervention. It is a devise to identify key stakeholders and establishes an appropriate framework for participation in project selection, design, implementation, monitoring and evaluation. The Karnataka Pilot Project started with 100 AWCs. Now it has AWCs in all revenue taluks and 10 urban areas (185 projects with 40,301 centres).

Methodology

The study is being conducted in four districts of Karnataka (one in each revenue division). Two projects in each of these four districts were selected for the study. Of the 8 projects, one was a tribal project, another an urban project, while the other six are in rural areas. 30 AWCs were considered in each of the projects.

Some aspects/issues which affect the functioning of AWCs and performance of AWWs have been revealed during the visits to the AWCs and an interaction with AWWs, AWHs supervisors, Chile Development Project Officer (CDPOs), Program Officers (Pos) and Deputy Directors of the Department (DDD). These include, lack of basic infrastructural facilities, lack of coordination (within the department and between departments), political pressures, problems of communication and little/no active community participation.

Field Insights

Some of the insights gained by the authors during their visit to the Centres, interacting with the workers are presented here.

Distorted Information

Many of the policies/schemes do not spell out the actual activities expected to be performed (and the duration by which to complete the activity) by the "grassroots" workers (AWWs). Considering the low educational qualification of AWWs (in many cases) and their rural background, more simplified, direct communication is necessary.

To illustrate, the ICDS scheme, at the time of its launch in 1975, defined the activities to be performed by AWW to include non-formal, pre-school education and a mid-day meal. Later, it included in the scheme, children (six months to three years), pregnant women and nursing mothers as the beneficiaries besides children of three to six years. While expanding the target group, no provision was made to specify:

a. Whether the women who come and stay in their village of origin for pregnancy were to be considered as beneficiaries during the period of their stay in the native village.
b. If the women who, after three to four months of delivering the child, return to their husband's village would be included (with their children) as beneficiaries.
c. How the additional number of children were to be considered.

A few of the AWWs are able to manage such situations by their personal skills and/or community support. But many were not clear how to deal with such situations, as they have only a vague communication. Many times, due to several levels of organisational hierarchy, the intended communication was totally distorted when it finally reached the grass-root-level worker. The grassroot workers were aware of their mistake (due to the distorted communication) only after completing the said activity when CDPOs/DD questioned them.

Delayed Communication

The remoteness of some of the villages, infrequent/irregular visits by supervisors to AWCs and underdeveloped communication technology, resulted in delayed and distorted communication to AWWs. Efforts were made by DD to inform CDPOs who inform supervisors, who in turn communicated to AWWs under their supervision to con-vey the messages in time. Generally, sectoral meetings held monthly for AWWs by respective supervisors were used to communicate to AWWs about future activities (for the month) to be undertaken by them. Activities chalked out in a routine manner are communicated through sectoral meetings. But, activities planned in a very short period of time were communicated through official channels in the line of hierarchy. Major distortions took place in the process and did not reach all the grassroots workers, as the only means of correspondence was posting/mailing the letter and in some villages a post office did not even exist.

Lack of communication was the major constraint for integrated development. Even within the office of PRI, some officials claimed not to be aware of activities, programs, and workshops scheduled in a particular month. This office was supposed to bring all developmental activities in rural areas under its control.

Lack of Coordination

The lack of coordination was generally due to a lack of proper communication. As the concerned functionaries were not aware of their additional responsibilities, they were not able to coordinate activities within and across other related departments. As regards the lack of coordination between related departments, the major issues were:

- Lack of communication.
- Sense/feeling of superiority over the other department's official.
- Ignorance and/or indifference about the significance of coordination.
- Lack of involvement of the functionaries in the activities they performed.

Lack of Participation by Panchayat Raj Institutions (PRIs)

The main idea of establishing PRIs is to ensure that local needs were met in time and in a justified manner. The elected members of Taluk Panchayats and Village Panchayats were to be from among the local community, so that they understood the local issues better than those elected/nominated from other regions. But, it was found during the study, that many of the executive officers (EO) of Taluk Panchayat were not even aware of number of AWCs existing and functioning in the taluks they were representing. Many of them were also not aware of the number of educational institutions and health institutions (and services) existing in the taluk. Though they could state the number of village panchayats

in their taluk, they were not able to state how many were taking active part in rural development activities.

Each of the ICDS functionaries, looked at the program from a narrow perspective limited to his or her respective role in the program. As a result, these functionaries lost sight of the larger perspective of the development of women and children by taking into account all parameters of development.

ROLE OF ICT IN STRENGTHENING ICDS ACTIVITIES

1. Develop a well-planned Management Information Systems (MIS) at State Level (Director DWCD) and disseminate necessary information to Districts (DD Office) and Taluks (CDPOs). For an effective MIS, a strong and reliable database is necessary. Efforts are to be made to collect appropriate data about potential beneficiaries, existing beneficiaries and also earlier beneficiaries who are out of ICDS services due to their changed status. Updating of survey details (home visits by AWWs) every quarter is necessary. Much of the communication could be timely and streamlined with an effective MIS. Good maintenance of computers is necessary both at district level (DD Office) and taluk level (CDPO Office) to access the information. CDPOs are to ensure that all relevant information reaches the grassroot workers through the supervisors in a timely manner. Much of the distortion in communication can be rectified with effective MIS. At present, use of computer as a technology is non-existent. In the absence of computers, nodal officers are to be assigned the task of ensuring that supervisors have communicated the right information on time to AWWs.

    Using MIS, distorted communication and delayed communication can be reduced to a great extent initially. Gradually, effective communication could be a positive feature of DWCD. This MIS can be effectively linked to the decision-making process.

2. Better coordination is possible with effective communication. Through orientation programs to functionaries (with a duration of two to six days) at least twice a year, the department can emphasise the significance and need for coordination and team tasks. The program should include the assessment of current activities and future activities of various sections of the DWCD (at district level, taluk level and block level), possible linkage of activities between sections and how to function as a team. Bi-annual orientation programs need to be conducted

when there are many changes in policy implementation. If changes are minimal, the orientation could be annual. Such orientation programs should preferably be at the taluk level and/or block level to facilitate those functionaries to participate.

3. A well-planned link between the Department of Women and Child Development (DWCD) and the Departments of Health and Education should be developed. The link so developed should be explained to all three departments and each of their roles should be clearly specified. Each community also should be made aware that these three department work complementing their activities. They are independent departments, but they should not be isolated ones.

    To illustrate, Government Primary Schools should insist that a certificate from AWW certifying that the child completed three years at AWC is necessary for that child to be admitted in I standard of their school. Alternatively, the Government primary schools can obtain a list from AWW of those children who completed five years six months to six years in each academic year who had enrolled in AWC. Such children should be accorded first preference during the annual enrolment exercise.

    Medical officers at Primary Health Centres/primary Health units/Sub centers should maintain a record of AWWs' referrals with date of referral, age of the patient, nature of illness and treatment given. They also have to maintain a record of number of visits made and various AWCs (date, month) in a year, their observations during such visits and treatment given, if any. Such records should be used by these Medical officers to send a consolidated health report about AWCs in taluk to CDPOs. CDPOs can use this and assess the health and hygiene status of AWCs and their beneficiaries in their jurisdiction. The monthly meetings should also have an agenda of discussing the health status of beneficiaries.

    DWCD should maintain a record of coordinating activities with related departments and the outcome of such coordination. A quarterly evaluation would ensure better coordination. Such records could be developed into a database and made accessible to all relevant functionaries.

4. Community participation needs to be strengthened for an effective functioning of ICDS services. Awareness programs are to be arranged to emphasize the role of community participation in the effective performance of AWCs and AWWs. Community members should be made aware that the program is for the social and health development of their village and the government is a mere facilitator. AWCs are

currently positioned more as food distribution centers and pre-school activities have taken a back seat.

5. PRI officials seldom consider their role as related to developmental activities of their taluk and villages. They are more concerned about adhering to administrative procedure than about the actual development of taluk and villages. They should equip themselves with knowledge of the current status of education, health, DWCD and all related institutions in their taluk, assess the deficiencies and strengths and suggest measures for better performance. Nodal officers should make more frequent visits to assess the on-going status and accordingly take action. An active participation of PRI officials would facilitate efficient functioning of AWCs.

6. Political leaders can positively influence the PRI officials, community members and AWWs. Using their political power, they can continuously monitor the functioning of AWCs, report any deficiencies to CDPOs and ensure that beneficiaries get maximum benefits. Political leaders also can create awareness among community members about the significance of AWW and the role to be played by the community members. The political leaders should gain knowledge about ICDS services, functionaries and officials involved in it and should visit AWCs at least five to six times per year. Political leaders can play an important role in communicating properly to the community members about the role of AWWs in the overall social and health development of villagers. The present notion that AWCs are food distribution centers by many villagers should be corrected and the pivotal role of AWWs should be reinforced/made clear to community members.

7. Social marketing is an important aspect in any government-based rural development program/scheme. This can be possible only with effective channels of communication. All concerned government officials and functionaries should take the responsibility of communicating effectively and ensure that it reaches the grassroot functionaries in a timely manner. Two important aspects to be considered are:

- Mode of communicating to rural masses.
- Use of simple, comprehensive language while communicating.

A well-developed, taluk-level MIS (both at CDPO office and Taluk Panchayat Office) would facilitate effective communications. It should include the status of health, education, basic infrastructural facilities (road, transportation and communication facilities, water facilities and the like for five years including current year). It should be accessible not only to CDPOs but also to block-level officials. The executive officers (EO) of Taluk Panchayats should also have an MIS and update their information system every year. The CDPOs and EOs should be users as well as information providers. Well-developed information communication would lead to successful implementation of ICDS services and thus help realize its objective of overall development of downtrodden women and children.

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ENDNOTE

[1]   The viewpoints expressed in this article are that of the authors and do not represent the position of IIMB or UNICEF.

Information Literacy for Telecenter Users in Low–Income Regional Mexican Communities

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INTRODUCTION

The purpose of this article is to propose a methodology to increase information literacy among people who attend telecenters in low-income communities in Mexico. The Mexican government created telecenters, or community technology centers, as part of a national project under which adults lacking basic education who are isolated and living under economically and technologically marginal standards are granted access to educational materials and work training in the form of printed, audiovisual, and electronic media (CONEVyT, 2001). Our research group evaluated the Mexican telecenter program as part of a nationwide qualitative diagnostic study, which represented the initial stage of a three-year research project conducted by the Information and Communication Technologies for Education and Community Development research group at the *Universidad de las Americas-Puebla* in Mexico for the National Institute for Adult Education. The results of this study combine with the concepts of information literacy and socioconstructivist pedagogy to form the basis for the present proposal.

This article is organized in three parts. The first is centered around a discussion of current literature treating technology for social development, including the afore-mentioned diagnostic study on telecenters, or *plazas comunitarias,* as they are called in this Mexican project. The purpose of the second part, which is to explore a different perspective on the subject at hand, is developed during a discussion of information literacy and social constructivism. The third part fleshes out ideas broached in sections one and two and proposes a methodology for technology community centers, as the *plazas comunitarias*, under which information literacy and personal development are promoted.

BACKGROUND

In this section, the traditional view that access to technology leads to social development is analyzed and criticized. This view may be considered limiting as it might hinder potential benefits from reaching users of technology; to illustrate this point, results of the diagnostic study on the *plazas comunitarias* project in Mexico will be presented and discussed.

Technology for Social Development

In most developing countries, providing access to information and communication technology (ICT) to low-income populations—that is, bridging the digital divide—is a high priority since it is widely believed that ICT can be a tool "for social action and positive social change" (APC, 2003, p. 12) as well as a facilitator of "more productive and rewarding lives" (McNair, 2000, p. 9). However, in developing countries, the ICT revolution remains an unfulfilled promise to low-income populations due to obvious access inequalities and the conviction of developing societies that access to technology implicitly leads to social development (Moghaddam & Lebedeva, 2004; Curtain, 2004). It makes perfect sense then that most efforts made by these governments are dedicated to supplying the technology with the expectation that this is enough to decrease the digital divide.

According to Hewitt (2001), these expectations are simply too high, and it is an overstatement that just giving people access to the Internet broadens their employment opportunities and improves their chances at achieving sustainable economic growth. In the same vein, León (1999) accepts the importance of access to information and communication technology, but agrees with Hewitt that this alone does not constitute entrée into a new stage of social development. During an OECD roundtable discussion of ICT and the digital divide, participants commented that the gap is not digital, but rather educational, and they stressed the need to empower people with educational, cognitive, and behavioral skills instead of just supplying them with equipment (OECD Secretariat, 2000). Steyaert (2000) adds to this list the need to develop information skills in order to become fully information literate. And finally, in a 1996 UNESCO report, Delors worries about the high hopes for social change that are imposed on technology. He declares that the so-called information and communication revolution is not purely technological and that it is important to situate it in a greater social and economic context, a comment that

touches on one of the chief criticisms directed at the supply of technology in an effort to diminish the digital divide.

A Diagnostic Study on Plazas Comunitarias

A prime example of a project under which a one-dimensional, causal relationship is asserted between technology and social development is the *plazas comunitarias* project in Mexico. To clearly understand how this linear view prevents users from exploiting the full potential of ICT, the results of the diagnostic study conducted by our research group are explained here (for the full research report see Salinas, Porras, Santos, & Ramos, 2002).

Problem Statement

The *plazas comunitarias* are being opened nationwide to allow low-income populations the opportunity to: 1) attend literacy and non-formal basic education programs; 2) receive continuing education; and 3) become technology literate.

However, due to lofty aspirations on the part of the government at the project's outset, the *plazas* were opened at a hectic pace. Thus, the Institute did not have time to develop a basic model that would aid them in integrating the objectives they hoped to achieve. Understanding the need for such a model, the Institute contacted our research group to aid in the development of an educational model.

Research Design

The main objective of the qualitative study was to diagnose how the *plazas* were functioning during their first year in operation. It was an exploratory qualitative study done in a sample of 17 *plazas* in six Mexican states over a six-month period. Researchers employed observation and in-depth interview as data collection methods as well as a number of informational sources. To encourage inclusion and expand the sample's variability, the *plazas* were selected using purposive sampling. Questions asked during the study included: How do students learn? How are ICT being used? How are all its physical areas being used? How are the *plazas'* services being promoted? How are the *plazas'* personnel performing their job tasks? And how are the *plazas* relating to their local communities? All observations were recorded in research journals. Finally, the constant comparative method of inductive data analysis was used to identify patterns that might help us understand how the *plazas* were functioning.

Results

1. Although the *plazas comunitarias* project was something new for the Mexican population, it was not entirely an educational innovation as the project lacked a systemic perspective and failed to consider many of the complexities of the social system related to the *plazas*.
2. The *plazas* were operated as traditional schools, not as center of adult education. The opening of the *plazas'* buildings caused employees and adult students to feel that they were in a formal learning environment, and technological materials were used in the same way as in traditional schools. That is, ICT served only as a vehicle of information and not as a mind-tool (Jonassen, 1996).
3. Telecenter users frequently engaged in cognitive processes of the lower orders. In fact, most observed teaching, learning, and utilization of technology practices were focused on the memorization of content for answering multiple-choice exams. Therefore, these adults were not developing higher order skills that would improve their everyday lives, such as learning to learn, problem-solving capabilities, and collaborative learning methods.
4. The role of ICT in the *plazas* was basically to teach its users the essential functions of the equipment and how to manipulate it in order to extract information. Thus, there was no clear understanding of the potential of ICT to improve quality of life or teach life-long learning skills. For the *plazas*, using technology meant only the rote learning of software applications, so ICT was not really perceived as part of the whole knowledge construction process.
5. The *plazas comunitarias* are not decreasing the social inequalities and exclusion of the poor because the people that need these services most are not stepping forward to become telecenter users. They do not recognize any link between the services offered at telecenters and their own personal needs. On the contrary, individuals with more education and belonging to a higher socioeconomic class go to the *plazas* without outside encouragement since the benefits of ICT are more obvious and credible to them. Thus, traditional economic and social inequalities and exclusions are simply replicated at the *plazas* rather than decreased (Steyaert, 2002).

A DIFFERENT PERSPECTIVE

The literature previously cited in this article suggests the employment of an alternative perspective on the use of

ICT for social development. To this end, the notion of information literacy and the epistemological and pedagogical concepts of social constructivism are discussed in this section.

Information Literacy

Access to technology is not enough to effect a real difference in the quality of life of socioeconomically disadvantaged populations. Physical access to technology is not as critical as developing information skills, that is, becoming information literate (Steyaert, 2000, 2002). Possessing such skills is a central factor in dealing with social inequalities and exclusion since too little attention is currently paid to developing individual knowledge-acquisition skills, which aid in the satisfaction of individual needs and interests.

The American Library Association (1989) defines information literacy as "the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand." This definition is dynamic because it states specific skills and actions that would allow a person to solve a problem and, at the same time, become information literate. It is important to note that this person's goal is to solve a significant, personal problem and not to become information literate. In this regard, Dewey (1938) addresses the importance of acquiring skills as "means of attaining ends which make direct vital appeal" (p. 6).

Social Constructivism

In contrast to traditional objectivism, which assumes that knowledge is "out there" and that it can be transferred to the person, social constructivism takes the view that knowledge is a process more than it is an object, a process through which individuals develop higher cognitive abilities and construct knowledge through social interaction (Driscoll, 2000). In this social constructivist vision, "knowing is not a static disposition of actors, but rather an ongoing social accomplishment" (Orlikowsky, cited in Rowland, 2004). Moreover, the social constructivist posture contends that knowledge is closely related to action and with the context and situation within which it is constructed and used (Brown, Collins, & Duguid, 1989). According to this epistemological perspective, social constructivist pedagogy strives to build learning environments focused on problem solving, where the sharing of knowledge is encouraged through collaborative learning to allow for free meaning development and negotiation. Within one of these learning environments, ICT must be dynamically integrated into the social processes so that people can actively and collaboratively use ICT as a mind-tool (Jonassen, 1996), instead of learning passively from ICT equipment as sheer carriers of information.

METHODOLOGY TO FACILITATE INFORMATION LITERACY

Drawing from ideas presented in the last section, our research group designed a methodology for the *plazas comunitarias* to promote social development by integrating the use of ICT. This methodology is based on information literacy and social constructivist pedagogy.

The Methodology's Goal

As Figure 1 demonstrates, the methodology's goal is to engage the *plazas*' users in a "virtuous cycle" (that is, the opposite of a "vicious cycle"), within which they experience a dynamic process that leads them to a higher state of well-being. The energy that drives a virtuous cycle comes from within the participants themselves; it is generated when a decision is made to act collaboratively and become motivated to satisfy a significant need. To organize these collaborative actions, users develop a group project—that will eventually satisfy the previously identified need—by performing a series of activities.

The premise is by getting involved in a significant activity, the person develops the necessary intrinsic motivation to seek out relevant information and make critical decisions to solve his or her problems. These motivated people would naturally use any tool available, including computers, to achieve their personal ends. In this way, ICT becomes a problem-solving mind-tool

Figure 1. "Virtuous cycle" of ICT integration

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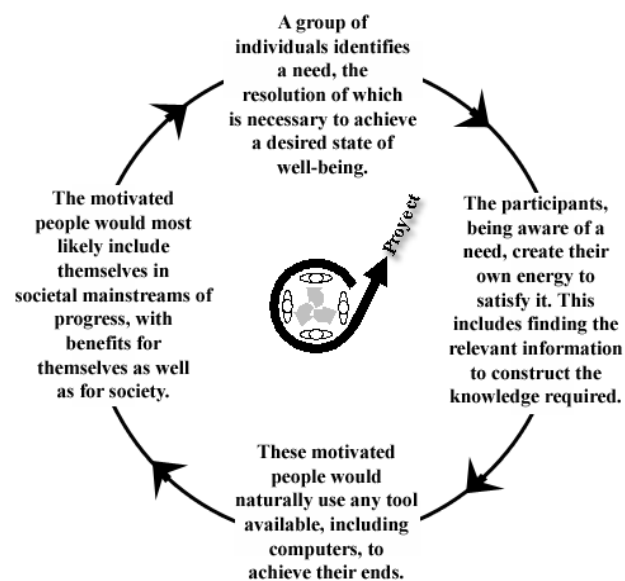
instead of being an end in itself. The hypothesis here is that motivated people would most likely include (rather than exclude) themselves in societal mainstreams of progress, producing benefits for themselves as well as for the community.

Project Development

The heart of a virtuous cycle is the set of activities in which users participate in the development of a group project. This process starts at any *plaza comunitaria* when one of its educational advisers invites a group of users to initiate a group project. The process may be carried out with one person alone, but two or more are preferred as the methodology attempts to exploit the proven benefits of collaborative learning. Then, the adviser and the group complete five different activities, as shown in Figure 2. Selecting a problem (defined as anything that interferes with the satisfaction of a need) as a team and then developing a project to solve it is the first step. The adviser then asks the participants to share their life circumstances with the group and identify problems to which a solution might improve the quality of their lives.

Once each person has expressed their life circumstances to the group and has identified at least one problem, the adviser begins a process of discussion, consensus, and action with the group with the goal of selecting the problem to be solved. The decision is based on which problem is more closely related to their community, taking into consideration their local values and

culture, and how much knowledge they already possess with respect to each problem.

Next, the group repeats the process of discussion, consensus, and action, but now with the purpose of imagining possible solutions and selecting one for the chosen problem. The selection is made based on such criteria as pertinence, available resources, cost, and time. Then, in order to avoid lengthy discussions and to focus their efforts, the adviser asks the users to imagine a product that they could develop to embody that solution. This product becomes the ultimate goal of the project.

To systemize the group's actions, adviser and users construct a work plan to develop the identified product. This is done by listing all the possible activities and subtasks that must be accomplished to reach the project's culmination. Once they are listed, the adviser writes them down in a table format using the following columns: "Task Description"; "What information do we need?"; "What do we need to learn?"; "Which media might we use?"; "Who will do it?"; and "How much time is required?" Finally, as part of the work plan, the group discusses a strategy and makes a list of activities that it might do to achieve community acceptance of its solution-product.

Once the work plan is established, activity begins and users—whose goal it is to complete the project and not to learn certain technology—start to naturally integrate ICT as a mind-tool and develop the information literacy skills needed to accomplish their goals.

CONCLUSION

This article has presented a different way of using IT for social development, one where the individual, his community, and his local culture become the center of all activities. The methodology proposed here has now been tested in the field, and its results will be presented in a future publication. However, there is still much work to be done in this area; we need to develop more research and development projects with a systemic perspective if we want to understand the use of ICT in complex social contexts. In such cases, a phenomenological view seems to be much more powerful for understanding how a socioeconomically excluded person could improve his quality of life by having access to, for example, the Internet. The qualitative paradigm and the related methodology introduced in this essay appear to be the right choice in experiencing and comprehending the myriad relationships that are cultivated inside a telecenter. Once inside, we might, together with the local players, inductively construct the knowledge necessary to propose broader solutions to the issue of facilitating social development and equality through the implementation of technology.

Figure 2. Activities to develop a group project
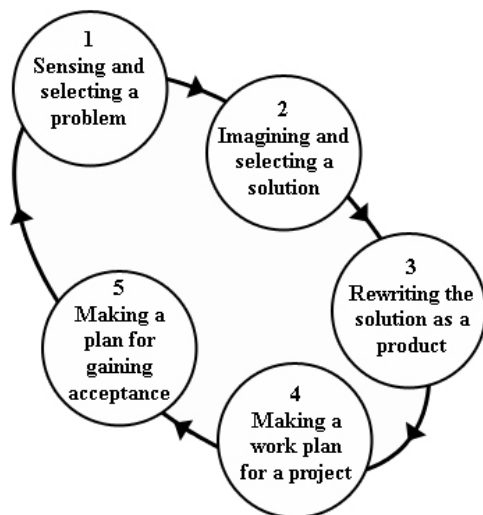
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KEY TERMS

Cultural Function of a Telecenter: Set of processes that a telecenter as an open social system carries out to strengthen grass-root values and identity. ICT should facilitate multiculturalism instead of pursuing the standardization of society.

Distributive Function of a Telecenter: Set of processes that a telecenter as an open social system carries out to foster the egalitarian distribution of its benefits and ICT growth and integration into the community's social dynamics.

ICT as a Cognitive Partner: Traditionally, ICT is used as a vehicle of information, but when used as a cognitive partner, it collaborates in the thinking processes of humans by performing actions such as changing a graph instantaneously or supporting a person to build his ideas when designing a concept map.

Information Literacy: The ability to collaboratively know when there is a personal or communal need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand. (This definition is based on that given by the American Library Association (1989), however, here a social construction of knowledge dimension was added.)

Pedagogic Function of a Telecenter: Set of processes that a telecenter as an open social system carries out to foster social construction of knowledge and the development of cognitive and collaborative skills in ICT users; using ICT as a cognitive partner to empower people instead of as a vehicle of information.

Socio-Organizational Function of a Telecenter: Set of processes that a telecenter as an open social system carries out to strengthen and support the natural social groups and organizations that exist in its local community.

Telecenter: An open social system where people interact among themselves, with technology and with their context, exchanging information, materials, ideas, feelings, and so forth. The purpose of a telecenter is to maintain this flow by: (1) carrying out cultural, pedagogic, distributive, and socio-organizational functions; and (2) providing access to the necessary technology.

The Information Society in Ukraine

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INFORMATION SOCIETY DEVELOPMENT IN UKRAINE

In order to assess the prospects for the development of the information society in Ukraine, there is a need to consider the possible directions or approaches that such development might take. In *The Diversity within Unity,* Etzioni (2001) states:

Two approaches are to be avoided: promoting assimilation and unbounded multiculturalism. Assimilation–which entails requiring minorities to abandon all of their distinct institutions, cultures, values, habits, and connections to other societies in order to fully mesh into the prevailing culture—is sociologically difficult to achieve and unnecessary for dealing with the issues at hand, as we shall see. It is morally unjustified because of our respect for some normative differences, such as to which gods we pray. Unbounded multiculturalism—which entails giving up the concept of shared values, loyalties, and identity in order to privilege ethnic and religious differences, presuming that nations can be replaced by a large number of diverse minorities—is also unnecessary. It is likely to evoke undemocratic backlashes, ranging from support for extremist, right-wing parties and populist leaders to anti-minority policies.

Taking into consideration Etzioni's recommendation, there is a need to search for an intermediate approach. However, this raises at least two questions. First is when to precisely commence a movement towards a synthetic approach to the construction of the information society, taking globalization into consideration but preserving the local identity. The second question is who—a leader, a certain group, a class, elite, or a society, in general,—should become a "key executor" of such a grand plan? In other words, the first question calls for an answer regarding the time of the "moment of truth" when ephemeral social illusions give way to specific financial and economic plans and programs.

Toraine (1997) stressed that the "moment of truth" being sought should be understood as the last step-wise stage between the industrial and post-industrial eras. This is a result of the gap appearing between the international economy and a nation-state leading to the destruc-

tion of such a model of a society that unites instrumental rationality and cultural identity. Researching the new social movements at the end of the 20th century, he developed a so called "action sociology" which he used to state that it is "new and diverse social movements, not political or state institutions" that are the true driving force of progress.

The foregoing sets the boundaries for the answers to the questions posed above. This article now analyzes the social and economic conditions in the development of the Ukrainian civil society in order to expose any "gap between the international economy and the nation-state" as well as the existence of "new social movements."

In such an analysis it is not useful to be overly enthusiastic since it was the Marxist classicists who were the first to write about "the new social movements" and state that "when an idea grips the masses, it becomes a material Force" (Marx, 1848). Of course, what they meant under the notion "the masses" was a new social force; an oppressed class of worker formed during the first stage of capitalism in the process of re-appropriation of added value (peasantry is the capitalism's heritage from feudalism). That is why, bearing in mind Marx, we must ask:

- In what way are "the new social forces" being formed in the post-industrial society?
- Amongst which social strata existing in today's society should we look for the "blessed springs of the information society"?

These questions are the key to exposing the productive and cultural identity of both a person and social environments. On the one hand, these form the new information society. However, on the other hand, they are themselves being formed from the "old" social groups including "workers and peasants," a notorious "middle class," a ruling elite and even the bearers of the incomprehensible "national idea."

IDENTITIES AND THE INTERNET

In examining these questions, it is useful to examine the writings of Castells (1997) in *The Power of Identity* which provides a basis to not only to answer these questions but also to begin discussing a notion of "identity." Castells

dedicates his book precisely to the effects of the emerging phenomena of the information society on the new social movements, state policy and the *personal reactions* of the people in the world to globalization and "sprinter" technological development. Castells' principle propositions are as follows (Castells, 1997):

• The most important feature of the information society is not its dominance of knowledge but in the change in direction of the use of knowledge which displaces previous forms of both personal and property dependency typical of industrial capitalism;

• Globalization gives rise to a tendency to increase identity which can help an individual withstand the external world since the new social structures being formed are networked communities;

• With the beginning of the information era, relations between "society" and the person not only harmonize but become more intense;

• Social and biological traits of human beings, which lock them in the narrow forms of "old communities," are juxtaposed with the global traits that incorporate them into the new world structures;

• The essence of the networked human identity lies in the fact that for the individual, the process of self-identification becomes self-sufficient. Identifying the value orientations of activities of such self identification based on a specific cultural identity, excludes the necessity to address other social structures;

• There are three types of network identity and each of them can play a key role as a driving force of social progress; they are as follows:
  • legitimizing identity, which is typical of industrial society and corresponds to a system of values of a traditional civil society and nation-state;
  • resistance identity, which is typical of a period of transition when a new value system, recognizing the significance of local communities, is formed; and
  • project identity, that is the based upon a personality that is shaped in the information society;

• A role of the new social movements based on the resistance identity and the project identity protests against the existing social structures;

• Whilst the protest identity is destructive, it is a key source of energy to progress from the industrial to information structures; and

• Technology *does not determine* either historical evolution or social changes but is a potential resource for the development of society and provides for different models of social change.

Thus, according to Castells, the new social forces in the post-industrial society are formed during the processes of searching for both personal and group resistance identities in order to form a new project identity in the end. Of course, this approach cannot be expressed by means of unified social and political, or economic rules of behavior or recommendations, since the globalization process is not regionally homogenous. For instance, certain regions, such as the Pacific region, appear to be actively involved in the global economy while other regions including certain African and Asian countries, are prejudiced against or hostile to concepts of globalization.

Whilst acknowledging the role of the Internet in formation of the information society, Castells nevertheless stresses that network communication is not a universal means of communication and is not likely to become one in the near future. He considers that:

new electronic net media do not depart from traditional cultures: they absorb them. Social and cultural differentiation leads to the segmentation of multimedia users. It also increases social stratification among the people. The multimedia public will be populated by two separate populations: the interacting and the interacted and it is critical for all kinds of social effects that there should be the development of an open and horizontal network of communication instead of exclusive and closed on-demand media services. The significance of the multimedia increases tremendously in a system in which reality itself (that is, peoples material/symbolic existence) is entirely captured, fully immersed in a virtual image setting, in the world of make believe, in which appearances are not just on the screen through which experience is communicated, but they become the experience. (Castells 1997, pp. 372-375)

Castells contrasts the old forms of national, religious, class and ideological identity with the new networked identity. It is well accepted that national identity in the nation-states historically determined the legal relations between the state and its subjects. Identity based on formal citizenship plays the same role in the multinational states. However, separatist movements based on the notion of national identity exist even in such developed countries as Canada or Spain.

Today, a religious identity is a base for many Muslim countries. But even in such countries there are contradictions derived from different interpretations of religious principles or Confessions of faith. The same can be said about class and ideological identity which, it can be argued, was never fully employed in any country.

In the early part of the 21st century all other forms of identity, including the impacts of such key factors as

culture, traditions, history and language, play a role of symbolic interpretations of the national identity in many countries, since they only play a system-forming role in the period of military encounters.

One other dichotomy in the domain of labor division in industrial society is a division between urban and rural cultures. A specific feature of urban culture and identity is *event intensity in the complexity and the tolerance in the decision-making process*. This is not a "gift of havens." It is nothing else but a manifestation of the instinct of self-preservation in places with high-density of population without which personal and group collisions would hamper development. In 1900 one in ten people in the world lived in a city, in 1994 every second person lived in a city, while in 2004 the number of city-dwellers exceeded 87% in developed countries. At the beginning of the 21st century, megapolices appeared, and their management is becoming a key problem for the 21st century. On the other hand, devotion to traditions and conservatism, which are also derivatives of a specifically rural way of life and agricultural production, called "idiocy of rural life" by Marx (1948), are typical of rural culture.

At the first stage of development, the information society inherited all features of urban culture of the industrial society and reflected them on the Internet. To a great extent, the Internet was a manifestation of urban culture and active Internet users in the cities were the first representatives of the networked identity. A networked identity, an Internet function, "given to us in sensations," provides both an individual and virtual communities with a possibility to "resist the external world" (not symbolically but actively). It can also "incorporate" in the emerging new world structures without the blessing of either the state or other subjects of a dominating national or religious identity.

In other words, in the situation when network communications are open for free access, it is easier for individuals, who do not have any particularly strong national, religious or ideological reflections, to find themselves a comfortable "refuge" on the Internet in various old social groups. Moreover, in the information society *a networked person practically does not need direct contact with the old power or social structures.*

In the process of self-organization, based on personal or group experience in the sphere of the formation of networked identity, a departure from a legitimizing identity which is peculiar to the industrial society and nation-state resistance identity, takes place. But all these "departure" phenomena *should not be regarded as destruction of identity as such but as the destruction of the old forms of identity and the formation of new forms of identity*. It upon this base that social movements and forces, aimed at the formation and development of the information society, will be formed.

Finally, it is useful to consider the views of the Russian scientist Inozemtsev's paper "Senselessness of Questioning":

posing a question like which forces, personal and individualistic or communal and state-oriented, can determine progressive development of Russia is fallacious. Today any state is objectively incapable of controlling key resources of public development which are now information and knowledge… Russian state is an intellectual and moral bankrupt that is attempting at presenting its surface polish for an evidence of solvency and conceals its scandalous failure to offer any appealing development strategy to the nation by the slogans of struggle for stability. In no country in the world community-type consolidation promoted liberation of capacities and potential of each individual… In the Russian situation, absolutization of a community development principle is inevitably leading to the state bureaucracy. (Inozemtsev, 2004)

PROBLEMS AND PROSPECTS FOR UKRAINE

In spite of the fact that many wanted to avoid the loss of identity in the process of globalization, its preservation, according to Castells, is in any situation doomed to failure since legitimizing identity sooner or later transforms into resistance identity. However, in Ukraine we still have not made it clear which aspect of identity we are talking about, whether it is national, religious, class and ideological, urban, or rural. We are a multinational state and that is why it is complicated to discuss a national identity. On the other hand, religious, class and ideological identities are hardly topical in the development of an information society.

In spite of the fact that in 2004, 67% of the population lived in the cities, Ukraine still had a typical representation of a rural identity. The matter at hand cannot be adequately represented by statistical figures alone but requires examination through the *chronological dynamics of the migration of generations*. In 1991, Ukraine had only entered into the third stage of the five-stage Gibbs model of urbanization (Gibbs, 1963), and in this stage the increase in the urban population is provided not by birth rate, but by migration from a countryside.

In 2004 the majority of elite representatives still originated from the rural areas, either first or second generation. In such a situation it becomes difficult for these representatives to learn to think in the moral, ethical and intellectual terms required of urban culture and to tolerate their opponents in order to perceive the information

society as a development factor. Due to this rural-communal bias towards conservatism and a communitarian model of the civil society, there is a tendency to simply copy and disseminate negative features of the socialist command-administrative system. This is generally elitist. But there is also the concept of a ruling elite to be considered. Power can be considered to be an obtrusion of the will of certain subjects upon others using physical or symbolic violence. Fortunately, there are reasons to believe that the sad times where physical violence to impose power have sunk into oblivion in many situations. However, what is left in its place is a symbolic violence in the form of threats, regulation of behavior, both personal and business, playing out the traditional identities of Orthodoxy or Roman Catholicism and obscure propaganda of values of some sort of integration, for example Euro Atlantic integration. That is why it is difficult to look for the new social forces amongst our ruling elite and is probably, a waste of effort. Such new social forces are more likely to appear within civil society. It is the resistance identity, which will play a regulatory role during the period of transition from an industrial to an information society. This will appear in the sphere of goals, alternatives, and activities, which are most likely to be the system-forming factors of the civil society.

In this context, the resistance identity either of society as a whole or as a fragment of it, will take the shape of civil identity. This implies a certain level of identification by an individual with the information society, a readiness to exert influence upon the formation processes and to bear responsibility. In short, this implies "good old ethical norms."

It is nevertheless necessary to approach the spontaneous manifestations and "germs" of the civil society with particular care, barring excessive "freedom" euphoria. Since many of the initial approaches still bear the features of "democratic centralism" and totalitarianism whilst their leaders, under a civil society slogan, often still act with personal, selfish or power-seeking motives behind their efforts.

Same caution should also be taken when approaching the state sector. The concept of an authoritarian state, of course, will not disappear easily. However, if it is to survive, the state will increasingly need to rapidly adapt and transform in the direction of the civil society. Given the entrenched nature of the state systems, it is unlikely that this will occur synchronously but most likely lag a generation behind. Such a situation can be clearly seen in divergence between the implementation of external policy of the sovereign state in building international partnerships and internal policy in which there is a decentralization of power to regions. Such decentralization involves the delegation of certain functions from central bodies to the regions and NGOs in order to form network distribution of authorities.

Any phenomenon, be it globalization, identity, or information society, is in reality a process. Developed as a speculative theory, the notion of the information society naturally reflected all specific features of the age of industrialism just as Marx' communist theory reflected the features of the capitalism of the middle of the 19th century. Therefore it is clear that the information society in the middle of the 21st century will remind us of Bell's (Bell, 1973) or Toffler's models (Toffler, 1987) in the same way the USSR reminded us of the Manifesto of the Communist Party. The "Manifesto of the Communist Party," of course promised, that "the proletarians have nothing to lose but their chains. They have a world to win." However, a "proletarian identity" did not rescue toilers from slavery, and the communist bureaucracy became the true winner.

Nevertheless, there are a number of key issues in information society theory, just as in the theory of communism there was "no private ownership of productive tools" and "the dictatorship of the proletariat." In the notion of an information society, the equivalent unshakable principles are "open society" and "freedom of communication and personality." If these principles are maintained, then no social or economic phenomena will be able to dissolve any form of identity which will emerge from the legitimization of a civil identity. It is the national identity of the country that will undergo few alterations. Since historical practice has demonstrated the stability of this form of identity (only tribal identity is more ancient than this one) and it will accompany our life for centuries to come. However, it is the nations themselves that will undergo changes in similar fashion to the way a national identity of "Roman" gave way to "Italian."

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KEY TERMS

Globalization: This term was first applied to the world economy, which under conditions of global information and communication network can basically operate as a unified system in the real-time mode.

Identity: According to Inozemtsev (2004) and authors of the WSIS 2003 Declaration *identity* is *originality*. Overall, identity can be understood as a system of factors that make it possible for a human being or a community to relate to another. Selecting certain factors as dominant in this system, the researches arrive at certain types of identity—personal, group, national, class, cultural, professional and so on, as far as "fan-group" identity.

Information Society: The 2003 WSIS "*Declaration of Principles - Building the Information Society*" states that the information society is the society where anyone can produce information and knowledge, have an access to them, use and share them in order to provide individuals, communities and nations with a possibility to fully actualize their potential, securing their sustainable development and improving the quality of life, on the basis of the goals and principles of the UN Charter and fully abiding by the Universal Declaration of Human Rights.

Information Technology Standards in China

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INTRODUCTION

"If you want to access my market, you have to use my standards." This seems to be the approach adopted by some in China and certainly is the line promoted by the Director of the Ministry of Information Industry's research institute, Chen Yuping (Chen, 2004, p. B.1). Standards have been seen to be the cards available to China in its negotiations, given the desire of many multinationals to locate or outsource their businesses and operations in the Chinese market.

BACKGROUND

Many multinational firms have located in developing countries such as China to develop their overseas and industrial markets and to take advantage of low cost environments. Multinationals find it profitable to contract IT software and services in developing countries and many have done so in China.

China's reform and opening up in the late 1970s gave the impetus to rapid economic growth. This reflects such outsourcing as well as its source of cheap labour, highly skilled workers, and modern factories. Increasingly domestic demand and the size of the Chinese market provide a growth mechanism for the economy and outsourcing enables access to this growing world market.

China's entry into the World Trade Organisation no doubt will have an impact on accessibility of investors into the market and demonstrates the realisation of the globalisation of markets. This is especially the case in terms of IT, which has been a major player underpinning rapid growth occurring in the Chinese economy.

The Chinese computer industry has been a main player in the growth of electronic and IT industries in China. From January to October 2003 the Chinese computer sector achieved sales of 453.7 billion yuan (U.S. $54.6 billion) (Info-Prod Research, 2003, p.1). This represented an increase of 64.7% and can be equated to a contribution by IT of 15% to a 34.6% growth in industrial sales in the country for that period (Info-Prod Research, 2003, p. 1).

Gartner, Inc. anticipates Chinese demand for IT services to be an estimated U.S. $25 billion and U.S. $30 billion by the year 2007, a growth of eight times the present level of demand (Jen Lin-Liu & Singh, 2004, p. 26). No doubt the Beijing 2008 Olympics also will contribute to this growth and will lead to a greater presence of multinationals and increased investment in IT in the country (Xie Jia, 2004).

Advocates of globalisation focus on removing barriers to trade. However, where their interests potentially could be affected by global competition, they often seek to protect their interests. Nationalism takes over from globalism (Datt, 2004, p. 1). This seems to be the case in terms of IT standards in China.

STANDARDS

One of the ways China is striving to shift their position from assemblers to innovative firms that are able to compete internationally is to use its market size to create competing standards rather than allowing multinationals to create the technology, set the standards and control industry.

One such example of this is the attempts by Government and industry to establish critical technology standards regarding 3G wireless standards called TD-SCDMA, rather than adopting worldwide CDMA2000 or WCDMA standards.

This strategy sought to solidify China in the telecom-equipment industry. TD-SCDMA was hoped to guarantee Chinese manufacturers some role in the Chinese market as foreign corporations such as Nortel Networks Ltd, Royal Philips Electronics N.V. and Siemens AG were willing to form partnerships with Chinese firms-Datang Mobile and Huawei Technologies Co. Ltd.-to manufacture TD-SCDMA equipment.

However, China recently agreed to put on hold its wireless encryption standard that differed from IEEE802.11 standard adopted world wide. This encryption technology was to be provided free to 11 Chinese national firms ranging from large players such as Huawei to smaller emerging players. What this meant was that after June 1, 2004 companies selling Wi-Fi equipment to China would have had to licence technology from one of these national firms and incorporate it into their equipment.

Why is multiple standards a problem? Technical stan-

dards ensure that, say, a CD bought in one country can be played on a CD player made in another. Standards typically are set by groups of manufacturers or, increasingly, by international organisations. If China enforces its own standards, companies would need to make special versions of products to sell in the Chinese market, adding cost and complexity (Chen, 2004, p. B.1). Compliance with multiple standards would have been onerous, hence the reaction from other players in the market.

China, in promoting its interests and in endeavouring to reduce reliance on foreign technology and multinationals, has attempted to "shake up the global standards game" (Chen, 2004, p. B.1). In setting its own standards China was seeking to strengthen its position in negotiating royalties or technology transfers which it has had to pay to use components and software developed by others (Chen, 2004, p. B1).

China, in attempting to enforce its own standard, was striving to use its "clout" as the factory floor of the world and as an emerging market, potentially being one of the largest wireless markets. It assumed that this encryption standard would be supported. The shelving of this standard was in the face of growing pressure from other players, including Intel Corp. and the U.S. Government.

Some observers see the need for the Chinese to emerge as leaders in setting standards through "inducement" rather than dictating terms (see Stevenson-Yang in Chen, 2004, p. B1). Failure to do so could lead to being "cut-off from export markets, international customers and collaboration in technology" (see Stevenson-Yang in Chen, 2004, p. B.1). Some in the Chinese bureaucracy are taking a more flexible approach to the standards issue, underscoring the need to work in partnership with the international community.

China's domestic market and its role as a major player in IT manufacturing has lead it to consider setting other standards, especially those that are compatible with standards already established. Examples of this are in the areas of RFID and video-compression technology. Partnerships with foreign companies to set standards potentially could benefit China to enable it to access new markets, and vice versa. It is understood Nokia is working with Chinese manufacturers to develop a standards for the next-generation Internet (Chen, 2004, p. B1).

Despite this decision it is likely that China will con-

tinue to promote its wireless encryption standards. Further work is being undertaken to draft additional standards regarding routers and other Internet hardware and software that deal with security issues (Chen, 2004, p. B1).

Nevertheless the issue remains one of "why should we follow established standards when we could design our own?"

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KEY TERMS

3G: Third generation technologies. 3G is the generic term used for advanced multimedia wireless communication.

IT Standards: International standards that ensure compatibility of technologies produced throughout the world.

Multinational Corporations: A company that owns or controls production or service facilities in more than one country and so conducts business globally.

RFID: Radio Frequency Identification is a technology used to uniquely identify objects, often in transit.

Innovation in Wireless Technologies

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INTRODUCTION

There is no doubt that wireless communication technologies have been one of the most interesting innovation fields in the telecommunications industry in recent years. The spectacular rate of innovation in this field has enforced the vision of ubiquitous connectivity: the vision of a world where every human being and every electronic device, from high-end supercomputers to tiny sensors of temperature in your car, can talk to each other through a dense web of communication links. A vision of this kind, although more "human-centric," is proposed, for example, in the "Book of Visions" (2001) published by the Wireless World Research Forum. Of course, wireless communication technologies are instrumental in accomplishing this vision, as we cannot possibly imagine to connect everything by means of cables. Moreover, wireless communications offer the advantage of supporting mobility even at high speed.

The goal of this short paper is to propose one possible explanation why wireless technologies have shown such a dramatic innovation rate, and to overview some of the main and most recent technology achievements in this field. We will see that innovation is fostered mainly by freedom to experiment, and that countries offering such freedom, by means of wise regulation, can benefit most of these innovations. Wireless technologies, in fact, have a number of features which make them the best candidate solution for developing countries wanting to create a communications infrastructure with low costs and in a short time frame.

One of the main features of wireless technology can be summarized in one word, *freedom*. Freedom, to some extent, from physical constraints, as there's no need of laying cables through land, roads and buildings, from cost constraints, as most of the times the cost of a wireless infrastructure is significantly lower than that of a wired one, from time constraints, as usually wireless networks can be deployed in a very short time-frame compared to wired infrastructures, from location constraints, as wireless connections can be established potentially everywhere, even in motion, finally, and most significantly for this discussion, in some cases freedom from access constraints, as some frequency bands have been wisely set aside by national and international regulatory administrations to be used as a "spectrum commons" (Lessig, 2002).

These bands, such as the 2.4 GHz "industrial, scientific and medical" (ISM) band, are allocated for license-exempt use, meaning that you don't need to ask permission to anybody for using the spectrum. "Users in these bands are liable for interfering emissions they cause, but are not protected from interference from others. Significant incentives are therefore created for users to deploy innovative systems" (Lie, 2004, p. 16) which can minimize interference between different transmissions, as well as optimize the co-existence of many different wireless systems. Moreover, the freedom of access to spectrum has fostered innovation, as there's no administrative or market restriction for innovators to experiment.

Lessig (2002) argues that the staggering innovation fostered by the Internet was mainly due to its character of openness, neutrality and freedom of access. In much the same way, "spectrum commons" have favored innovation at the physical layer, by giving innovators the right to design, implement and deploy innovative systems without asking permission from anybody. Most of the recent technological innovations have been designed to operate in license-exempt bands. On the other hand, if spectrum policy had an impact on the innovation rate of the wireless world, in turn technological advances and innovative services are changing the way regulatory administrations allocate and manage spectrum (Lie, 2004; Reynolds, 2004; see also the "next generation" program of the U.S. Defense Advanced Research Projects Agency).

There is another reason why "spectrum commons" favored innovation, and this is linked in some way to the "end-to-end principle" (Saltzer et al., 1981). This principle, when applied to network design, states that the network should be as simple and neutral as possible, leaving the "intelligence" at the ends, that is to the applications. The reason why this principle fosters innovation is that it allows flexibility for future uses: a very complex architecture might be optimized for one or more uses, but most probably it will not be good for all the future uses yet unseen. In much the same way, radio devices emitting in the spectrum commons have to respect very general rules, mainly aimed at reducing mutual interference and allowing the peaceful coexistence of different systems in the same frequency bands (see for example the Part 15 rules of the U.S. Federal Communication Commission, that define conditions under which radio devices can operate license-free). Moreover, because emission in the spectrum

commons is free, developers are pushed to design advanced techniques in order to protect their system from unwanted interference of any kind (e.g., other radio systems, microwave ovens, etc.) and to share the available spectrum in the best way. Traditional wireless systems assume the receiving terminal is "dumb," in the sense that it cannot easily differentiate between the information signal and background noise. In traditional systems, interference should be avoided at all costs, and this is usually achieved by imposing exclusive licenses and strict regulations about how the spectrum must be used, by whom and for what use. The intelligence is placed in the way the spectrum is managed by regulatory administrations, not at the ends in smart terminals. Recent smart radio terminals developed for use in the license-exempt bands, on the other hand, embed advanced signal processing techniques to sift through interference and pick out the information signal.

REFERENCE MODELS

The vision of the wireless world proposed by the Wireless World Research Forum (The Book of Visions, 2001) puts users and their needs at the core of the definition of network architecture. This user-centric approach can be described by a "multi-sphere model," where the user and the external resources interact via communication links on different levels that can be depicted as concentric spheres around the user. The inner sphere represents the closest interaction with small devices in the personal area of the user. This involves Body Area Networks (BAN), connecting wearable appliances, body sensors and portable devices, such as cellular phones and audio headsets. The next level of interaction is with objects around us, such as personal computers, TV sets and other home appliances that form our Personal Area Network (PAN). The next concentric sphere outwards represents interaction with resources confined in a limited area, usually building-wide, connected together to form a Local Area Network (LAN). Over wider areas, we can interact with any resource in the world through Metropolitan Area Networks (MAN) at city level and Wide Area Networks (WAN) at regional, national and international level, represented by the outermost sphere. Because of regulatory limitations of the allowed transmission power, the advanced wireless technologies developed for use in license-exempt bands can operate only in the inner spheres, up to LAN level included.

This reference model, however, developed around a human user, is not well suited for yet another increasingly important scenario of innovation: Machine-to-Machine (M2M) networking. In this case, the vision is of a world of interconnected devices with distributed "intelligence" that can talk to each other through a mesh of communication links. Some of these devices can be extremely simple and small, such as tiny sensors or smart tags that can be spread over a wide area for monitoring or control purposes ("sensor dust"). In this case, the best reference model is arguably a peer-to-peer architecture supported by a "mesh network," where there's no central or focal point such as in the multi-sphere model, but every node of the network is functionally identical to every other node.

MULTIPLICITY AND CONVERGENCE

Within the inner spheres of the multi-sphere model, a multiplicity of heterogeneous wireless technologies have been designed and deployed, to better fulfill specific user needs at different mobility levels, bit-rates, costs and services provided. Each radio technology is best suited to specific scenarios and applications, hence multiple wireless technologies are foreseen to co-exist in the short-term at different levels of interaction with the user (Redaelli, De Francesco & Ragazzi, 2003).

The transmission techniques developed for license-exempt use must comply with local regulations and must be designed to cope with harsh propagation environments and all sorts of unwanted interferers. The most important transmission techniques for this kind of applications are: *spread spectrum*, frequently used in today's wireless products due to its robustness against noise and interference; *orthogonal frequency division multiplexing* (OFDM), implemented in more recent wireless LAN products and considered also for use in Metropolitan Area Networks; *ultra wide band* (UWB), currently under investigation.

Spread spectrum is a technique pioneered by the army trading bandwidth for robustness. It uses more bandwidth than required to reduce the impact of localized interferences. Usually, one of two main spread spectrum technique is used: *direct sequence* and *frequency hopping*.

The principle of direct sequence spread spectrum is to spread the signal energy on a larger band by multiplying it with a *code*, a fast repetitive pattern of bits. In this way, for each bit of information the system actually transmits many bits of code organized in a pre-defined pattern known both at the transmitter and the receiver. The energy of the signal is spread over so a large bandwidth that it looks just like background noise to "traditional" radio receivers, which may not be significantly interfered with by spread spectrum transmissions. At the intended receiver, the original signal is recovered by correlating the wideband signal with the same spreading code used by the transmitter. Only the original signal gives the best match at the correlator block and therefore the impact of

any other interfering signal is reduced. This technique is used, apart from the newest generation of mobile phones also known as Third Generation or 3G, by the widespread WiFi technology based on the IEEE 802.11b standard. The WiFi industry is one of the fastest growing and has a lot of interesting applications in many different market sectors such as home offices, small offices, enterprises, retail, logistic, healthcare, Internet service providers, telecom operators. Direct sequence spread spectrum is also used in the newly born Zigbee technology, backed by IEEE 802.15.4 standard (draft), which has been designed for use in the M2M scenario to interconnect a large number of tiny electronic devices to form what is sometimes termed the "Internet of things."

Frequency hopping is another spread spectrum technique that divides the available bandwidth into a number of narrow-band channels and uses all of them in a pre-defined sequence. Periodically, the system "hops" to a new channel, following a pre-determined cyclic *hopping pattern*, which is known both at the transmitter and the receiver. The system avoids interferences by continuously jumping from channel to channel. If a channel is interfered, the system might not be able to use it and just waits for the next good channel, thus averaging away the effect of bad channels. This technique is employed by Bluetooth/IEEE 802.15.1, the main technology available today within the inner sphere of the reference model for Body/Personal Area Networks.

The idea behind OFDM is to divide the available spectrum into many sub-channels or sub-carriers. Conceptually, we can think of dividing the original data stream into *n* parallel data streams, then modulate each of them and transmit all together in the same band. This system, if supported by intelligent optimization algorithms which can adaptively and dynamically choose the best modulation and coding technique to be employed on each sub-carrier, is a powerful tool to cope with dynamically changing radio channels and unpredictable interference patterns. OFDM technology is used today in new generation wireless LAN products of the 802.11 family, notably 802.11g and 802.11a, and it is the basic building block for the next generation of wireless MANs, based on the recent IEEE 802.16 standards family.

The FCC loosely defines "UWB technology" as any wireless transmission scheme that occupies a bandwidth of more than 25% of the center frequency, or more than 1.5 GHz. But the main innovation here comes from the unconventional transmission technique proposed for some UWB implementations. UWB is typically implemented in a carrier-less fashion: conventional systems transmit information by modulating a continuous sinewave; conversely, some UWB implementations transmit a train of ultra short impulses and remain "silent" between consecutive pulses. This technique is also known as "impulse radio" (Sholtz &

Win, 1998). Besides claimed advantages of low implementation costs, low power consumption, robustness to both interference and intentional jamming, UWB technology promises to co-exist with other conventional radio systems without causing noticeable interference, due to the extremely low power spectral density of the signal, which is perceived as background noise by conventional receivers. This opens up new possibilities of spectrum re-use, by letting UWB devices transmit on the same frequencies already allocated to other services. Moreover, the ultra short duration of impulses is instrumental in achieving very precise distance measurements (as a matter of fact, UWB technology was pioneered mainly by the radar industry), thus allowing the design of a radio modem that can simultaneously transmit information and measure the distances of surrounding objects. This could be applied in many applications of great interest, such as monitoring and control systems for warehousing, logistic, public protection, industrial plants.

On February 14, 2002, the FCC adopted a First Report and Order that permits the marketing and operation of certain types of UWB products under Part 15 rules, that is, license-free operation. These rules represent a cautious first step and set very restrictive emission limits, as there is little operational experience with the impact of UWB on other radio services. Nevertheless, putting UWB under the license-exempt regulation will undoubtedly spur innovation in this emerging field in the near future. The most promising applications for UWB technology appear to be in two distinct scenarios: high bit rate PANs for distribution of multi-media contents in homes and offices, and low-rate, low-power networks of sensors and small devices with added localization capabilities.

It is not the goal of this paper to cover all the innovations and research trends in wireless technology, but just to review some of the main innovative techniques proposed for use in the license-exempt part of the spectrum, and to highlight how this wealth of innovation can be related to the existence of "spectrum commons" which give innovators the right to experiment and deploy new systems without asking permission from governments or monopoly holders.

However, the discussion wouldn't be complete without mentioning briefly the need of "technology convergence," at the terminal and network layer, in order to handle the growing number of available radio technologies that otherwise would be unmanageable by users, telecom operators, software developers and service providers. From the user's perspective, convergence of different wireless communication technologies at the end terminal is a critical point, since it would be obviously impractical to use one terminal per radio interface. The user wants to be always connected in the best

possible way using the same terminal. Therefore flexibility and self-reconfigurability are key concepts of current research activities. The system has to dynamically adapt to the changing communication link quality, service requirements and traffic loads supporting different communication protocols. In the long run, software-defined radio concepts (Reed, 2002) may play a key role, for it is conceptually easier to implement advanced self-reconfigurable and adaptive communication interfaces in software rather than in hardwired chipsets.

At the network layer, current trends are towards an integrated, multi-service, packet-switched network based on IP technology. The worldwide deployment of such an integrated network is by no means an easy task. Telecom operators and enterprises have a huge deployed base of legacy communication systems. The entire infrastructure has to move from circuit-switched technology, used for plain old telephone networks, to packet switching, while preserving interoperability between systems in the transition period. Besides traditional and innovative data services, the new IP-based network needs to provide the same services people are used to receiving from circuit-switched systems, including voice and video. Despite the tough challenges, there are a number of good reasons for going in this direction: today's dramatic surge of data traffic as compared to voice traffic, cost reduction due to the deployment and maintenance of a single-technology infrastructure, more efficient use of communication resources, increased interoperability between products and applications, support of new integrated services. To match all these requirements, the IP technology needs to evolve, in order to provide better quality of service, support mobility, improve security and reliability.

CONCLUSION

Wireless communication technologies have been one of the most interesting innovation fields in the telecommunications industry in recent years. Innovation is fostered mainly by freedom to experiment, which could be insured by national and international regulations setting how the radio spectrum is used, i.e., by the specific "spectrum policy." The freedom of access to the radio spectrum (and therefore freedom to experiment and deploy innovative wireless systems without asking permission from anybody) brought about a multiplicity of wireless technologies, each one suited to different needs and requirements. This multiplicity, which is foreseen to stay in the near future, would be totally unmanageable should it not be accompanied by a convergence at the network and application layers, which is also going on based on the IP framework.

In conclusion, wireless technologies, due to their peculiar characteristics, are the best candidate solution for developing countries wanting to deploy communications infrastructures at low costs and in a short time-frame. But only those countries which will introduce wise regulation of spectrum management will benefit most of the wireless revolution.

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KEY TERMS

Bandwidth: The difference between the limiting frequencies (highest frequency minus lowest frequency) of a continuous frequency band.

Bit Rate: In a bit stream, the number of bits occurring per unit time, usually expressed in bits per second. Usually, it measures the rate of transmission of information

(Electromagnetic) Spectrum: The range of frequencies of electromagnetic radiation from zero to infinity. The electromagnetic spectrum has been, by custom and practice, divided into "frequency bands."

Interference: In general, extraneous energy, from natural or man-made sources, that impedes the reception of desired signals.

Noise:

1. An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural sources.
2. A disturbance that affects a signal and that may distort the information carried by the signal.

Power Spectral Density: The total power of the signal in the specified bandwidth divided by the specified bandwidth. Note: power spectral density is usually expressed in watts per hertz.

(Radio) Channel: An assigned band of frequencies sufficient for radio communication. A channel is usually assigned for a specified radio service to be provided by a specified transmitter.

Signal:

1. Detectable transmitted energy that can be used to carry information.
2. A time-dependent variation of a characteristic of a physical phenomenon, used to convey information.
   Since the works of the French mathematician Jean Baptiste Fourier (1768 - 1830), we know that each signal can be represented equally well as a time-varying function or as a sum of sinusoids of different frequencies. Therefore, to each signal can be associated a "frequency band," that is the portion of the spectrum comprising all the frequencies of the sinusoidal components of the signal.

Intentional Online Learning Plans

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INTRODUCTION

The literature suggests a strong tie between literacy and job security; education and poverty. We know that those with higher literacy skills are able to participate more fully in the economy and society (Crichton & Kinsel, 2001, p. 46).

In Canada, due to provincial laws concerning compulsory education through grade 10, educators working in K-12 education and/or training programs are rarely dealing with issues of total illiteracy. However as Freire (1985) suggests, literacy/illiteracy is situationally different within a specific society. He explains that if a society does not write, being unable to write does not constitute illiteracy, but in a society where writing is seen as a fundamental skill, it forms part of what it means to be literate. As a society shifts its situations (e.g., moves from an industrial economic base to an information management economic base), the standard of what defines basic skills shifts as well. Therefore, as Canadian society moves toward a knowledge-based, global economy, mastery of the competencies required to function in that changed workplace become the new definition of what it means to be literate and functional. These competencies then constitute the new literacies (Eisner, 1998; Kist, 2003) and exclusion from them forms the evolving definition of illiteracy.

New literacies for the 21st century were defined at a 2002 summit in Berlin (Starks, 2004). Foundation skills and competencies in "… five types of literacies [were] promoted: technology, information, media creativity, global, and literacy with responsibility," (paragraph 6) recognizing that while traditional core literacies such as reading, writing and numeracy were still essential, they need to be considered in conjunction with the new five. Therefore, a community or society's desire to participate in a global context is tied to being able to function within this definition of literacy for its citizens.

This notion of an evolving literacy, directed by the changing economic needs of society, is supported by the 1991 SCANS report (The Secretary of Labor's Commission on Achieving Necessary Skills) that states in order to find meaningful work, high school graduates needed to master a combination of foundation skills and competencies (Crichton & Kopp, 2004). The foundation skills were determined to be:

- Typical skills inherent in grade-level appropriate literacy and numeracy;
- Thinking skills (reasoning, decision making, creative thinking, and problem solving); and
- Personal qualities (responsibility and self-management).

Suggested competencies include:

- Identifying, organizing, planning and allocating time, money, materials and workers;
- Negotiating, exercising leadership, working with diversity, teaching others new skills, serving clients and customers, and participating as team member; and
- Selecting technology, applying technology to a task and maintaining and trouble shooting technology (The Secretary of Labor's Commission on Achieving Necessary Skills, 1991, p. 8).

Research (Armstrong, 2000) refers to similar skills and competencies, tending to group them into (1) hard skills—math, reading, and problem-solving at high levels; (2) soft skills—group work and effective oral and written presentations; and (3) computer skills—routine tasks such as word processing, data management, and creation of multimedia presentations. Regardless of the terminology used, it is apparent that the demands of the changing work force in Canada are requiring education institutions to rethink their mandate and consider how to address the learning needs of those needing education, re-education, training, or re-training. The Canadian Council on Social Development states that almost half of the new jobs created will require at least 16 years of education, so the need for upgrading and retraining is even greater than it was a decade ago.

While a certain degree of emphasis must be placed on education for employment opportunities, it is important to note that many adult learners return to formal learning for other reasons. Research (Crichton & Kinsel, 2001) suggests that the acquisition of skills adds to an individual's sense of self worth and confidence. This has the potential to translate into an increased personal agency that allows individuals to volunteer and participate more fully in the life and unpaid work in their communities. While previ-

ously these individuals might have stayed in their homes or felt reluctant to volunteer their services, a study in rural western Canada discovered that participation in adult classes increased an individual's social capital and increased the volunteer labor pool in important social areas such as long-term care facilities, pre-school programs, home support for seniors, and similar unpaid yet very important community work. It is common knowledge that communities are as vibrant as their citizens and that much of the unpaid work that goes on in them is what makes them humane and civil places to live.

This paper argues that it is not enough for schools/ training institutions to just recognize the importance of returning to school, but they should also begin to design programming to invite back these learners. Nor is it enough for learners simply to want to upgrade their skills and education and return to formalized programs. Based on the literature and ten years of experience in the field, it appears that for learning to be effective and successful, there needs to be an intentional learning plan in place to bridge the complexities of the institutional structures, assess learners' prior knowledge, place learners appropriately within the existing programs, modify the content, and ensure that credential standards have been meet. Without an intentional learning plan, research (Crichton & Kinsel, 2001, 2002, 2003) suggests that this vulnerable sector of the population, typically at-risk youth, minority groups, low-income women, and individuals in rural communities who have seen their work supported from traditional jobs in resource extraction disappear, may be attracted back to schooling by new programs and incentives, but they may not stay. It appears that their ability to stay is affected by a range of confounding variables. These variables include tolerance for "getting things wrong," test anxiety, social support from family and friends, economics, child care, and other issues that may be deeply personal. These variables, plus the elements that Knowles (1980) describes as competing interests for adult learners, tend to impact and confound the learning experience.

Sparks (1999) suggests that rich and meaningful learning opportunities should provide a bridge to the future by helping students to learn how to learn, "… so they can keep up with the rapidly changing world" (p. 20). Crichton and Kinsel (2001) found that by allowing students to return to school with the goal of learning to learn rather than learning specifically for a work-related skill, students are often more able to experience success, discover that they could tackle something and carry it through, and develop a "zest for learning" (p. 52). This appeared to allow the learners to enroll in academically challenging courses and programs with a sense of self that had been missing in both their personal and professional lives. This finding is consistent with the early work of Goffmann

(1959, p. 20) who states, "We come into this world as individuals, achieve character, and become persons." The development of a positive sense of self appears key to learner success, and it must be recognized that it is something that individuals must create for themselves. Further, it appears that it is this increased sense of self that allows reluctant and/or seemingly passive individuals to become empowered to actively and fully participate in their communities.

The rational for the development of a learning program is predicated on the understanding that "the development of a complex, multi-faceted sense of self can increase student achievement and self-confidence. Individualized learning links the personal and social identities of students with the academic curriculum, mapping a pathway to activities appropriate to the needs and goals and the development of an increasingly complex sense of self" (Crichton & Kinsel, 2002, p. 143). This complex sense of self has the potential to translate into both academic and social success, adding a rich dimension to the lives of the learners.

THE LEARNING PLAN

Based on the work of Bandura (1977) and Chesebro et al. (1992), the learning plan suggested here is a critical tool to help build and support sustained relationships between students returning to school and facilitators in the individual sites. The plan allows students to learn over time the important "school" attitudes and behaviours that are key to success in various institutions.

The online learning plan allows students to respond either onsite with the assistance of the facilitator or later online by themselves. Because it is online (www.netidea.com/~ekinsel), it can be accessed virtually anytime/place. Currently, the plan is quite text heavy, but further development will see more multimedia options, making it more compatible with the research on multiple literacies and intelligences (Crichton & Kopp, 2004). However, there is concern that the introduction of multimedia elements will increase the required bandwidth and potentially limit access by rural users.

The theoretical framework for the learning plan is anchored in activity theory (Vygotsky, 1997). It encourages learners to think about what they want to do, how they learn best, what supports they need, and what their prior learning has afforded them. It also includes an interactive, personal journal area where the learner and facilitator can communicate about experiences, successes and failures, and generally document and personalize the learning experience. The purpose of the learning plan is to help learners articulate their personal needs and goals and allow the facilitator important insight in order to

individualize the program/course to specific learning needs. The format of the learning plan consists of a series of hyper-linked prompts designed to elicit increasingly complex responses from the learners, helping them to articulate their learning needs and personal goals.

When a learner enters a program, the facilitator greets her/him and introduces them to the facility. The concept of the learning plan is presented, and depending on a number of factors (comfort level of the learner, his/her time, number of things going on in the learning centre itself), the facilitator and learner start immediately using it. Initially, it is hoped that the learner and facilitator will work together to fill it out, but it is designed such that there are a series of fun, self-evaluation questionnaires that are designed to be ice breakers. The learning plan is not meant to be an evaluated document, but rather an interactive tool to support conversation between the learner and the institution (via the facilitator). It is designed to be as non-threatening as possible and at the same time to help the learner make sense of the rules and regulations of the institution (requirements for course completion, learning options, and general items such as that). The interactive journal area is designed to allow for text-based conversation between the facilitator and learner, but appears to be less threatening than a face-to-face conversation. Further, the plan captures all these elements in one place so they can be reviewed at any time during a learner's studies.

The learning plan recognizes that learning must start at a personal level, gradually progressing to the public and applied levels (Crichton & Kinsel, 2002). It is a conversation that starts in the local context of where the learner is at the time she/he enrolls and then expands to a global one (Starratt, 2001). Because it is a gradual and graduated individual journey, educators cannot simply start with the facts (the academic or vocational) while ignoring the sequence (p. 144).

The learning plan prompts information from the learner that supports three domains (Whittaker & Mayes, 2001): the cognitive, evaluative, and affective1. The need to focus on these areas is supported by experience with at-risk adults that found: (1) the recognition of self is usually overlooked in the learner intake process; (2) programs to support the development of self are lacking as the concept is not recognized in the intake process; and (3) the high drop out rate in these programs could certainly be attributed to issues of student self-identification and self-confidence.

Learning plans appear to allow learners to re-create themselves through what they learn. Further, as society recognizes the importance of lifelong learning, it is hoped that this re-creation process may become more a gradual evolution than a radical personal transformation, suggesting that learning is never complete, and people may want or need to stop and start the process as personal and economic needs dictate. It appears that the process of goal setting through the use of a learning plan allows the facilitators and learners to make public what typically is private. Eisner (1998) suggests that this action helps to "stabilize what is evanescent" (p. 17), allowing for editing and revision and dialogue.

FINDINGS ON THE USE OF A LEARNING PLAN WITH ADULT LEARNERS

In the Fall of 2003 a beta version of the online learning plan described above was ready for use by facilitators and learners. A prototype version of the plan can be viewed at www.netidea.com/~ekinsel. Because the components of the online plan are hyper-linked, they are not intended to be accessed in a linear sequence. The prompts are designed to provide opportunities for the learner to reflect on personal qualities and develop a concept of self/self–efficacy (Bandura, as cited in Lim, 2000), allowing individuals to organize and execute a course of action that may help to make sense of some events that affect one's life.

The prompts encourage learners to envision themselves five to seven years in the future and to clarify goals that have the potential to transform what the learners have discovered about themselves into a personalize road map for future learning. The prompts encourage the learners to identify specific details such as "… where the learning will take place, who will provide assistance, planned start and end dates, and a method to assess whether each objective has been achieved" (Kinsel & Crichton, 2004).

The research into the use of the learning plan with six returning adult women learners and two facilitators formed the basis of a master's thesis (Kinsel, 2004). It took place over a semester in two learning centers in rural British Columbia, Canada. A case study approach was followed.

Findings suggest that the learning plan helped students with the following: (1) understanding personal success and celebrating short-term accomplishments; (2) encouraging and supporting motivation and persistence; (3) managing time and competing interests; (4) facilitating interaction between the learners and their facilitators; and (5) developing realistic and achievable goals. All learners and facilitators reported that these were important aspects, especially for returning adult learners who had not been successful in previous school experiences.

One student in the study captured the importance of the learning plan, stating eloquently, "It is one thing to have goals in your mind, but another to have them on

paper and see them in black and white." This comment is consistent with the literature (Crichton, 1997; Cross, 1981) that focuses on the importance of making tangible and public what often stays only in an individual's thoughts and fears. This comment also resonates with the work of Eisner (1998), who notes that, "Nothing is so slippery as thought; here one moment, gone the next" (p. 17).

Two key areas of concern arose in this research. The first was the time required to complete the learning plan and the question of whether the learners could or would receive credit for maintaining it. An initial response to this concern is that it is a site-specific issue. While there are specific courses related to career and personal planning in two of the western provinces in Canada, this is not necessarily the case in other areas. The second area is the need for adequate professional development for facilitators. Again, providing this will be a site-specific issue as time will be needed for facilitators so that they can complete the online training module.

The findings of the use of the online learning plan with learners and their facilitators confirm its potential to assist with the identification of appropriate, achievable goals. Further, the findings suggest that online learning plans do support the intentional dialogue that appears to be at the heart of authentic learning which appears to help with the development of self-confidence and efficacy. The online aspect of the learning plan has the potential to allow busy adults to manage the competing interests in their lives and sustain conversations with peers and facilitators at times convenient to them.

CONCLUSION

Based on the literature into employment and personal empowerment and the initial findings of the use of the online learning plan with adult learners, it appears that the learning plan has the potential to be a powerful tool to assist learners make the transition back into formal learning. Further, it appears that it can help learners develop the motivation, find the encouragement, and make the commitment to continue their studies and achieve personal success. Inherent in the notion of increased personal success is the recognition that empowered individuals will be of benefit to their communities and society in general through their fuller participation in both paid and unpaid work.

While further research will be required, the initial findings support the notion that an online learning plan can help bridge what we know about the demands of the institutions and the needs of the learners. As the demand for skilled workers increases, the cost of illiteracy will increasingly be unaffordable in a knowledge-based economy both in terms of paid and unpaid work. The learning plan proposed here could provide the support that allows individuals to develop the skills they need in order to become full participants in a rich and meaningful society and increase their sense of personal worth and confidence through accomplishment and lifelong learning.

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KEY TERMS

At-Risk Learners: Typically individuals who struggle with the structure and/or content of formal education.

Community Building and Unpaid work: Recognition that communities don't just happen. They are built and evolve, usually through the work of volunteers who are not paid, monetarily, for their work.

Goal Setting: Ability to articulate steps within a strategy and to accomplish them.

Intentional Online Learning Plans: Individualized written strategy developed between a student and facilitator that outlines needs and goals.

Personal Empowerment: Ability to speak up and advocate for oneself.

Personal Success: Recognition that each person sees accomplishments differently.

Learning Centers: Locations where students can come for individualize instruction.

Literacy and New Literacies: Skills and knowledge required to function with the dominant society.

Sense of Self: Ability to see oneself as an individual and articulate who and what they are.

Introducing Electronic Governance in the Philippines

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INTRODUCTION

The Philippines has recently identified five key reform packages where information and communications technology (ICT) will play a key role: job creation through economic growth, anti-corruption through good government, social justice and basic needs, education and youth opportunity, and energy independence and savings (Patricio, 2004). Such an important role of ICT can be seen in terms of the signing of the Electronic Commerce Act of 2000, or the E-Commerce Act in June 2000. The law mandates all government agencies to adopt electronic means in their transactions within a period of two years (2000) of its signing.

BACKGROUND

Focusing on local governments, the National Computer Center (NCC, n.d.), assisted by the Department of Science and Technology (DOST), is bringing electronic governance under the acronym, e-LGU, to the local government units (LGUs), as part of DOST's Support Program for Electronic Governance (SUPRE-GOV). The e-LGU Project runs from 16 September 2003 to 15 September 2005.

Having learned from the experience of the 1990s, when DOS-based applications were introduced to LGUs but with very limited technical and financial support, the e-LGU Project recognizes the very limited resources to modernize LGUs' operations. Thus, it advocates the use of open source technology, reducing the dependence on expensive, proprietary software and limited third-party governance solutions used by the more affluent LGUs, but increases the need for training on software.

ELECTRONIC GOVERNANCE IN THE PHILIPPINES

The e-LGU Project of bringing e-governance into the Project LGUs, has six components:

1. LGU-IT Resources and E-Governance Readiness Survey (LGU-IT Resources, 2004);
2. Electronic Governance Seminar for LGU Executives (Electronic Governance Seminar, 2004);
3. Information Systems Development Planning (Information Systems, 2004);
4. Formulation of Data Standards for Local Governance (Data Standards, 2004);
5. Establishment of LGU Web Presence (Web Presence, 2004); and
6. Application Systems Installation and Users Training (Application Systems, 2004).

E-LGU aims to enable LGUs to use ICT in their operations to provide better public service. To be able to do this, it will determine the level of local government computerization and readiness for e-governance by means of a nationwide survey conducted in August 1992 (LGU-IT Resources, 2004). A total of 15,446 computer units are reported by 640 LGUs. The number ranges from a high of 435 units to one unit per LGU.

In the Philippines, LGUs are classified into provinces, cities, municipalities, and barangays (villages). Provinces are composed of component cities and municipalities. Highly urbanized and special cities do not belong to any province. Cities and municipalities are composed of barangays. Cities have the most number of computer units, with an average of 75 units, followed by provinces with 60 units, and municipalities with 10 units. The income classification of LGUs (ranging from first to sixth class as classified by the Department of Finance every three years) was found unrelated to their number of available computer units

Microcomputer systems accounted for almost all (97%) of the systems reported. As far as Internet and e-commerce are concerned, 30.7% of LGU respondents reported having Internet capabilities, and the majority (87.6%) of them are connected via dial-up The Philippines is divided into 15 regions, and two administrative regions (Cordillera Administrative Region and Administrative Region For Muslim Mindanao). Region III (Central Luzon) has the most number of Internet connection, then Region I (Ilocos), and Region IV-A (CALABARZON). LGUs with no Internet connection

attributed its absence to: "No ISP" (57%), "No Budget" (40%), and "No Management Support" (9%). A minority of 22% of the LGUs surveyed reported hosting their own Web site.

The Project aims to promote awareness and better understanding and commitment of LGU officials to e-governance through seminars (Electronic Governance Seminar, 2004). It will annually provide 100 LGUs with Web-enabled information system (using open-source technology) for improved assessment and collection of taxes (property and business) (Application Systems Installation, 2004). It will also establish a Web presence for LGUs and an interactive WAP-enabled Web presence for the pilot LGUs by the third year of implementation, with a local government portal for all Web sites (Web Presence, 2004). The Project will institutionalize ICT for 100 pilot LGUs by the end of the first year and 300 LGUs by end of the Project by preparing and approving LGU Information Systems Plans (Information Systems, 2004). The Project also aims to facilitate data sharing and information exchange through data standard development (Data Standards, 2004).

FUTURE TRENDS

The Project is definitely a step ahead in putting local governments into the ICT age. The selling point of the Project for the LGUs is the low cost of software used in the e-Real Property Tax System (RPTS) and the e-Business Permits and Licensing System (BPLS) applications. The use of the Internet to connect with their respective constituents provides the LGUs with a potent tool, which may even be interactive, to deliver services or to collect taxes.

CONCLUSION

Several questions arise in relation to the e-LGU project. Given the importance of the project, some sense of the costs involved and of the benefits to be derived from embracing ICT at the local government level must be given by the government agencies involved in the project. How many years does it take to recover the costs involved in the purchase of hardware, in man-hours, in materials used in developing the software, the Web presence, the standards?

It may not be a question of cost recovery, but it may be more economical to retain the analogue technology in the long-term, due to obsolescence, that hardware become outdated or prone to breakdowns even before the cost has been recovered. Is it possible that the analogue technology may be more cost-effective in the long-term considering the recurring power outages or instability in areas outside Metropolitan Manila?

What e-commerce uses do the LGUs have? Are the Internet connections only to provide Web presence, but no transactions for the LGUs? There is the problem of dated data observed in Web sites of local government units, as in accomplishment reports way back 2002. Is there a mechanism to address this problem?

The development perspective of maximizing the LGU presence in its area of jurisdiction must be said to be the future of all these efforts. Initially, revenue generation is the concern of the LGUs and the e-LGU proponents.

All these issues appear to be addressed by the use of the open-source technology (Open Source, 2004), giving the e-LGU Project a glimmer of hope in the world dominated by a proprietary operating system and applications.

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KEY TERMS

Digital Divide: The gap between those who have and those who do not have access to ICT (Alampay, Heeks and Soliva, 2003).

Electronic Governance (E-Governance): The use of information technology in reinventing and transforming the way public services are conducted (Alampay, Heeks and Soliva, 2003).

Government Online: The conversion of administrative processes into digital form (Verceles, Jr., 2001).

Information and Communications Technology (ICT): The collective use of the digital convergence of information (computer) technology, telecommunications, and broadcast (Verceles, Jr., 2001).

Multi-Purpose Telecenter: The community-based facility that caters to the information and communication needs of the people, using different intermediaries, tools to assist learning, and access to new forms of communication (Alampay, Heeks, & Soliva, 2003).

Wireless Loop Technology: Radio signals are used to transmit messages between phones and networks at a lower cost and fewer functions than that of the regular copper wire communications system (Alampay, Heeks & Soliva, 2003).

ITC Policy and Practice in the Fiji Islands

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INTRODUCTION

Since the establishment of Internet access in the Republic of the Fiji Islands in 1995, Internet policy has been developed in the country in the context of both national and regional development. Fiji has a significant tourism sector —15% of GDP in 2003 (Fiji Tourism Forum, 2003)—and Web-based information is an increasingly important source for potential visitors. The country also aspires to lead digital commerce in the region. In August 2004 the Qarese government affirmed its commitment to the "Bangkok Agenda Action Plan on Broadband and Information, Communication & Technology (ICT) development" (Bangkok Agenda Action Plan, 2004), an agreement calling for government action at a national, sub-regional and regional levels to encourage broadband access and usage. In addition to having one of the largest economies in the South Pacific, Fiji is host nation to a number of regional inter-governmental agencies, and this combination of national and regional interests is driving the rapid elaboration of ICT policy and utilization.

The government established a Department for Information Technology & Computing (ITC) in 1966 and for three decades was principally concerned with the provision of server capacity to government departments and agencies (http://www.itc.gov.fj). Policy development for e-governance was hindered in the late 1990s by the inability of the government's key computing departments to retain sufficient numbers of qualified staff. This human resource issue was linked to political crises in the country, which resulted in highly qualified citizens emigrating, and to the growth of IT opportunities in the private sector. Training of local staff was supported by JICA (Japanese International Cooperation Agency) and the Government of Singapore. Key sectors making use of computing services at this time included Customs and Inland Revenue, Education, Treasury, Taxation, the Electoral Commission, and the Criminal Justice System (Information Technology and Computing Services, Department of Finance, Annual Report 1995-96).

Pressures from providing day-to-day services to government, as well as the need to address the "Year 2000" issue prevented any activity on ICT policy during the period 1997-99 (Information Technology and Computing Services, Department of Finance, Annual Report 1997-99).

NATIONAL E-POLICY

By 2000 most government Ministries and departments in the capital, Suva, were connected to the Internet services provided through this Department. The South Cross cable was implemented in 2000, delivering strong connectivity to the rest of the world. In December 2001 the government's ITC Department commissioned an "e-Government Strategic Plan" to provide a "whole of government" IT plan. This document proposed a 10-year development plan to put in place fundament ICT policies, procedures and infrastructure, including whole of government policies, a disaster recovery plan and facility, service level agreements, a strategic review process, a fibre ring for government departments, intranet, links to regions, and competitive international linkage (Data #3, eGovernment Strategic Plan, 2001).

The 10-year plan established as three main themes e-development (establishing Government policy for all IT Development areas in Fiji); e-government (Infrastructure development for the civil service) and e-business (IT development involving the private sector) (Information Technology and Computing Services, 2001 Annual Report, p.10). The Government of Fiji established an ICT Council, which has commenced developing a policy framework. In 2002 the Council reported to the second Prepcom for WSIS that the Vision of the National ICT Strategy Plan was "To Develop Fiji into a Vibrant and Dynamic Pacific ICT Capital with a Thriving Digital Economy and IT Empowered Citizens." (Manager ITC Services , 2002). That report indicated that the government's National ICT Strategy Plan had four themes: E-government (as the responsibility of ITC Services, www.itc.gov.fj); E-commerce (Ministry of Commerce); E-personal (Ministry of Education); and ICT Industry (Fiji Trade & Investment Board, www.ftib.org.fj).

At this stage the Council was ready to broaden consultation to include more non-government stakeholders. A workshop on "Facilitating National Information and Communication Technology Development Strategies" held in June 2002 identified six projects worth pursuing immediately: PC recycling, national awareness campaign, rural telecom and telecentre development, policy development, e-government, and reform of the education curriculum. On the basis of such wider consultations and its

own further thinking, the ICT Council issued a draft "Fiji Information and Communications Technology Policy" in 2003 the ICT Department's Web site began to include some substantial content. Although it lacked any content on its "e-government" page (www.itc.gov.fj\e_government.html), it provided between one-third and one-half of the laws of Fiji in digital format (www.itc.gov.fj\lawnet\alpha_list.html).

REGIONAL E-POLICY COMMITMENTS

Further ICT developments in Fiji are concerned with ICT for the Pacific region. The three principle drivers of these regional initiatives are the Pacific Islands Forum, agencies of the United Nations, and the University of the South Pacific.

In 1999 the Pacific Islands Forum adopted a Vision for the Pacific Information Economy, and developed a regional approach to telecommunications regulation and tariff levels through the Asia-Pacific Telecommunity, the Pacific Islands Telecommunications Association, and the International Telecommunications Union. A framework for development of ICT in the Pacific region was outlined in the 2002 regional ICT strategy, the Pacific Islands Information and Communications Technologies Policy and Strategic Plan (PIIPP) (CROP ICT Working Group, Information and Communication Technologies for Every Pacific Islander, 2002). This "Pacific Umbrella Initiative" brings together the Pacific Island Countries and territories,[1] donor countries,[2] and intergovernmental agencies[3] to promote the use of ICT in support of sustainable development for the people of the Pacific Islands. The project is being coordinated by the ICT working group of CROP (CROP, 2002).

This ICT working group emerged in 2001 from the merging of IT-PACNET, a technical cooperation group involving IT managers within the CROP agencies that commenced in 1995, and the Information Sector Work Group, which dates to 1998. At its inaugural 2001 meeting the ICT Working Group identified three objectives:

- Review, clarify and provide advice on the development of priorities in the information sector;
- Determine areas of complementarity and overlap and any potential gaps in the coverage of existing and proposed regional activities and initiatives in ICT; and
- Recommend to CROP implementation procedures for enhancing coordination and cooperation, and for ensuring that priority areas are adequately addressed.

This coordinated effort made possible the intergovernmental "Pacific Islands Regional ICT consultation," in Suva in April 2003, in preparation for opportunities to take part in global dialogues under United Nations auspices. The Tokyo Declaration prepared at the Asian regional consultation prior to the World Summit for the Information Society included an "Islands Paragraph" pleading the special circumstances of Small Island Developing states:

Special circumstances of regional Small Island Developing States: These countries, vulnerable to environmental hazards, and characterized by small, homogenous markets, high costs of access and equipment, human resource constraints exacerbated by the problem of "brain-drain," limited access to networks and remote locations, will require particular attention and tailored solutions to meet their needs. (Paragraph 11, section 2, page 4 of SWIS/PC-2/DOC/6-E)

Complementing the CROP-based collaboration described above, the Fiji-based UNDP/UNOPS program has developed the "e-Pacifika Project" to facilitate the development of National ICT Strategy Plans for Fiji and various other Pacific Island countries. Other important regional organisations working on ICT development in the Pacific include the Pacific Islands chapter of the Internet Society (www.picisoc.org).

Another significant actor in ICT development in the Pacific region is the University of the South Pacific, a University with 12 member countries spread throughout the region. The USP has an active plan to promote ICT capacity, which includes the construction of an ICT facility on its Suva campus. In 2004 the University succeeded in breaking free of Fintel's monopoly hold over Internet access in order to gain access to the Australian universities AARNET network, and to make progress with the development of its ICT centre. In May 2004 the University responded to the Fiji Government's ITAC Draft policy "e-Fiji: the Future Online." While supportive of the general thrust of the draft policy, the University's submission calls for increased emphasis on the application of ICT to human and social development. When looking at the potential for application of ICT in the improvement of health and education, policy makers need to examine more closely their regulatory and legal frameworks. The costs of telecommunications are unnecessarily high in the Pacific Islands, due to the establishment of monopoly practices. As the island nations are made up of archipelagos having distinct transport and communications challenges, ICT policies need to be established at the outset that aid in reducing rather than multiplying the digital divide. The USP framework thus encourages

promotion of ICT in ways that assist in alleviating poverty, aiding the delivery of health and education, and in these ways promoting national unity and peace building in the region. Unfortunately, the monopolisation of telecommunications services in Fiji in particular, and in the Pacific island countries more generally, is blocking these countries from participating fully in the tremendous global opportunities for investment and employment growth resulting from low telecommunications costs.

FUTURE OUTLOOK

In 2004 the Pacific Islands Forum began developing a "Pacific Plan" to ensure that the region remains one of "…peace, harmony, security and economic prosperity" and called for the establishment of "stronger and deeper" links between the Pacific Island states. The Pacific Plan will include a "digital strategy" and consultations are currently taking place amongst all of the agencies and organizations referred to above to maximise cooperation in the development ICT initiatives for the Pacific region. Gaining globally competitive telecommunication costs for the Pacific countries must be the top priority for this strategy.

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KEY TERMS

Asia-Pacific Telecommunity: A 32-member body established in 1979 through joint initiatives of the United Nations Economic and Social Commission for Asia & the Pacific and the International Telecommunication Union (ITU). Members of the APT include Governments, telecom service providers, manufactures of communication equipment, and research & development organizations.

CROP (Council of Regional Organizations in the Pacific): An organization comprising ten regional intergovernmental agencies established to promote harmonisation and collaboration between member programs and to avoid duplication of effort and resources. Member agencies are the Pacific Community (formerly the South Pacific Commission), the Forum Fisheries Agency (FFA), the South Pacific Regional Environment Program (SPREP), the South Pacific Applied Geoscience Commission (SOPAC), the Pacific Island Development Program (PIDP), the South Pacific Tourism Organisation (SPTO), the University of the South Pacific (USP), the Fiji School of Medicine (FSchM) the South Pacific Board for Educational Assessment (SPBEA), and the Forum Secretariat which acts as CROP's permanent chair.

IT-PACNET: A technical cooperation group involving IT managers within the CROP agencies that commenced in 1995.

Pacific Islands Forum: An intergovernmental organization formed in 1971 comprising 16 member countries, established to foster cooperation in areas of mutual political and economic concern.

Pacific Islands Telecommunications Association: A non-profit organisation formed to improve, promote, enhance, facilitate and provide telecommunications services within Member and Associate Member countries. PITA comprises "members" (telecommunication entities); "Associate Members" (suppliers of telecommunication equipment and services); and "Partner agencies" (regional and international organisations with vested interest in telecommunications and its development).

University of the South Pacific: The USP was established in 1968 with 12 Member Countries: Cook Islands, Fiji Islands, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu.

ENDNOTES

[1]   American Samoa, Commonwealth of the Northern Mariana Islands, Cook Islands, Federated States of Micronesia, Fiji Islands, French Polynesia, Guam, Republic of Kiribati, Republic of the Marshall Islands, Republic of Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Pitcairn, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Wallis and Futuna.

[2]   Australia, New Zealand, France, UK and the USA.

[3]   Forum Fisheries Agencies, Pacific Islands Development Program, Pacific Islands Forum Secretariat, Pacific Islands Telecommunications Association, the Pacific Community, South Pacific Applied Geoscience Commission, South Pacific Regional Environmental Program, South Pacific Tourism Organization and the University of the South Pacific.

Leveraging Digital Multimedia Training for At-Risk Teens

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INTRODUCTION

The digital divide exists in poor countries and wealthy countries, the country side and cities, and across age groups. Useful solutions when trying to "bridge" the digital divide should include collaboration with local groups in order to better understand and meet their needs (Eglash, 2004). The most far-reaching examples of these community-oriented, information and communication technology (ICT) products and services result in social and economic impacts beyond just the use of technology—sometimes referred to as community informatics. This paper offers one such solution where an extremely cost—effective, community-based ICT program was successfully piloted in order to improve the computer and digital multimedia literacy of at-risk teenagers, provide job skills, open up new career opportunities, and begin to improve the overall economic capital of the community. While piloted in an inner-city, the program represents a best practice that is equally applicable to a small rural setting or to a regional educational initiative. More specifically, this paper describes the project, the curriculum, and—through the use of a questionnaire and video interviews—the students' experiences taking the class.

BACKGROUND

In July and August of 2002, two organizations combined forces to create a special six-week learning opportunity for 15 at-risk teenagers from Boston, Massachusetts' inner-city neighborhoods. The goal for the class was to learn film and computer-based multimedia skills, employ those skills through working in teams, and develop a video documentary. What distinguishes this educational opportunity from others is how computer technology was so actively intertwined in both creating and enhancing the educational experience.

During the first half of the six-week program, students learned about film history, utilized computer software to create and edit audio, music, and video tracks, and prac-

ticed performing the different roles necessary to create a documentary—producer, director, interviewer, cameraperson, and editor. The students spent the last three weeks working in teams applying their newly learned skills toward the creation of the documentary. The group assignment was to create an actual documentary. Within each team, each student chose a specific role to focus upon in order to develop a depth of skills in that area.

In an extremely brief amount of time the students, ages 13 to 18, had the opportunity to gain professional media experience and build confidence in a variety of technical and team skills. In the process, they utilized their full range of learning styles—from visual, to auditory, to kinesthetic—and exercised their critical thinking skills both individually and in a team setting as the hundreds of details in developing and refining a multi-track, multimedia documentary were worked through.

The sponsoring group for the class was ABCD (Action for Boston Community Development), a private, nonprofit, human services agency promoting self-help for people and neighborhoods that serves over 100,000 low-income Boston-area residents annually (ABCD, 2003). One of ABCD's programs, SummerWorks, is a summer jobs program for Boston's low-income, at-risk youth that has been in place for 35 years. For the summer of 2002, the SummerWorks program provided over 1,300 inner-city youth with paid, 25 hour a week community-based summer jobs that included mentoring, tutoring, and educational support. "SummerWorks enrollees worked in social service agencies, downtown non-profit and government agencies, museums, day camps, libraries, health centers, hospitals, and more. Enrollees also participated in workshops that provide job readiness and skill-building workshops" (ABCD, 2002). One of the SummerWorks 2002 opportunities was a special pilot program.

Fifteen of the students who were hired for ABCD's SummerWorks program were randomly selected to participate in a special skills-building program where they would create a video documentary of ABCD's 2002 SummerWorks Program. The students had no prior knowledge of what they would be asked to create, came from

various locations, and had no prior experience working with one another. Only two of the students had any previous experience creating digital video or digital audio. No academic credit was given for participation in the program.

The LCG (The Learning Community Group) of Boston, based on years of experience in the media production industry, designed and built the hardware and selected and customized the software needed to create a video documentary. TheLCG is a technology research and teaching organization dedicated to technology access and mastery by all people, regardless of age, gender, ethnicity or economic bracket. They develop programs that provide emerging technology instruction in a multitude of diverse settings: public and private schools, homeless shelters, libraries, community centers, government agencies and corporate offices (TheLCG, 2003).

The technology component of the class involved the utilization of The LCG Mobile Media Studio (MMS). The MMS is a professional and portable digital audio, video, and music production studio. The MMS is used to create and deliver material for the Internet, broadcast television, or a host of other CD and DVD media distribution formats. The hardware components included a high-performance digital audio/video workstation as well as high-end audio production equipment, including speakers, microphones, and noise-canceling headsets. The software components included professional-level programs for: creating electronic music, recording and editing professional audio tracks, recording and editing professional video tracks, creating CDs, and streaming media on the Web. Student support for using the MMS included printed guides and an online support community through forums (TheLCG, 2002).

The class met five days a week, from 9 A.M. until 3 P.M., for six weeks. The course was taught by a master instructor and film producer from TheLCG and assisted by a staff member from ABCD.

THE CURRICULUM

The overall objective of the six-week program was to develop a 25-minute, multimedia documentary about ABCD's 2002 SummerWorks program. Curriculum objectives leading to the overall objective included:

- Study film history
- Comprehend and use film language
- Gain media awareness
- Gain experience in executing every production role on a film or video set
- Develop film and video production skills
- Use digital video editing technologies fluidly

- Hone the art of storytelling
- Develop skills for working in teams

The curriculum was broken down into modules as described in the following sections.

Module 1, Week 1: Objective = Crash Course in Film History / Photography / Cinematography / Film Language

The first week had four major components:

- Description of class/job objectives
- A crash course on film history, photography, cinematography, and film language
- Initial exposure to the cameras and the video editing software
- Team building and interviewing skills

Although the crash course in film and production concepts was considered "too much like high school" by some in the class, they were able to apply the concepts taught in class effectively. One assignment challenged the students to find examples of the concepts on TV. Students accurately identified:

- An Eisenstein montage within a music video
- The rule of thirds being used on a game show
- Joseph Campbell's monomythic arc being followed in an episode of "SpongeBob Squarepants"

After one week, the students were ready to work as a production team to develop their first film short.

Module 2, Week 2 & 3: Cross-Job Training

During weeks 2 and 3, the class was broken evenly into two groups. The students, in essence, became employees. The students rotated from producer, director, interviewer, camera-person, and editor, trying every position at a number of sites around the Boston area. For example:

- Producers and directors contacted the site they visited, set up an arrival time, and scouted the location beforehand to get ideas of how to capture the site
- Camera-people worked on video taping locations and gained experience using the camera
- Editors imported the resulting footage and edited it to music in order to gain experience in using the editing software

Students typically visited one site per day.

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Module 3, Weeks 4, 5 & 6: Working on the Final Project: Creating the Documentary of ABCD's Boston SummerWorks 2002.

In week 4, each student ranked which job they were the most confident at and the instructor— based on observation and student preference—formed the production staff that stayed in place until the end of the project. From this point on, the instructor moved from a teacher role to an advisor role. Students decided where they wanted to visit, who to contact and what to ask. They became a fully functional production team.

Weeks 4 and 5 were spent recording footage from 10 different sites. Week 6, the final week, was spent doing post-production work—directors, producers, and interviewers wrote thank-you letters to the sites visited while the camera-people catalogued the tapes and footage. The class voted on their favorite sites and determined an order for the documentary. The segments were then assembled and the final product was shown to various audiences.

The Final Product

The final product was a 26-minute, professional quality, multi-track video documentary of ABCD's 2002 SummerWorks program—produced in only three weeks. The documentary can be viewed from http://www.thelcg.com/research.htm.

The video in its final form, complete with insightful interviews, professional visual composition, succinct story telling, and sophisticated editing is a notable achievement. However, the student's innate capacity and understanding of syncopation elevates the subject matter producing a final product that rivals a professional production. The digital video comprehension that was gained empowers the participants offering a new medium for self-expression.

Assessment of the Student's Work

Several forms of assessment were used to evaluate each student's progress throughout the program:

•   Students kept an ongoing journal for recording their thoughts and comments.
•   During the third week, a mid-program assessment was conducted. "One-on-one" meetings were conducted between the instructor, the ABCD assistant, and each student. Each student was given formal feedback, to gauge their excitement, dedication and personal investment in the project, as well as allowing them the opportunity to make suggestions and requests. This mid-program assessment was extremely effective in bridging the academic mode with the production studio end.

•   A final assessment was conducted through individual video reflections and a round table discussion. The individual video reflections gave the participants the opportunity to reflect on the process. In addition to this, the instructor and the ABCD assistant conducted a round table discussion about the process and the successes and failures that came with it. Students were not easy on themselves either. At this time they pointed out that they wished they could have had more time to perfect the audio in both recording and editing. These assessments were effective due to the ability of the students to make mature, professional, and sometimes poignant suggestions.

Relating the Course Curriculum to the State of Massachusetts' Language Arts Framework

To make the program relevant to the student's middle school and high school education, the course curriculum was designed to fulfill a number of the specific learning standards for grades seven through 12 as established in the state-wide curriculum frameworks by the Massachusetts Department of Education (Massachusetts Language Arts Framework, 2001). The course curriculum related specifically to the Massachusetts Language Arts Framework, especially for the following standards: media production; analysis of media; discussion; questioning, listening, and contributing; oral presentation; writing; consideration of audience and purpose; and revising. Details of how the program's curriculum relates to the Massachusetts Language Arts Framework are available from the authors.[1]

THE STUDENT EXPERIENCE

Students became very close through this process. By the nature of the project, creating a documentary, each group had to work together as a cohesive whole as well as take responsibility for their own actions and duties. By the end of the program they were more than classmates, they had become a tight-knit family as evidenced by the hugs and tears shared on the last day and their continued attendance beyond their final payday. As the instructor put it, "Throughout the process I witnessed students staying extra hours without pay four out of five days a week, not just because of the equipment but because they were excited to be creating a product, and enjoyed following its progress. Even once there was nothing else to do, students continued to come in at 9 A.M. and stay until 3 because they wanted it to still be a part of their

life." All of the students came in at least once after the program was concluded. Six of the 15 students appeared everyday for two weeks after the program concluded.

Data was collected about the student experience through two means. First, a 15-question student evaluation form made up primarily of 1-to-5 Lickert scale questions that provided space for an open-ended explanation for each answer was administered during the last week of class. Secondly, nine of the students were interviewed individually about their class experiences. Segments of those interviews can be found at http://www.thelcg.com/ research.htm.

Questionnaire Results

Twelve out of the 15 students in the class completed the questionnaire. A copy of the questionnaire, based upon a validated instrument from ASTD's 2002 Learning Outcomes Report, is available from the authors (ASTD, 2002). The questions used a 5-point Likert scale, where a "1" meant "Strongly Disagree," "2" meant "Disagree," "3" meant "Neither," "4" meant "Agree," and "5" meant "Strongly Agree."

Overall, students were *very satisfied* with the course (Q15), with an average response of *4.4* (Between Agree (4) and Strongly Agree (5)). Interesting results from the other questions include:

Student's Previous Experience

Student's previous computer experience (Q1 & Q2) was quite varied. Average student use of the computer before starting the class clumped into two groups:

- 50% used the computer six or fewer hours per week
- 33% used the computer 21 or more hours per week

Most of the computer use was for the expected—e-mail and chat, writing papers, and surfing the Internet.

Class Organization and Delivery

- **Understanding course objectives:** Students clearly understood the course objectives and felt the course met the objectives (Q5 & 6, Mean of 4.5 and 4.4, respectively). One student's comment, "I knew what I was responsible for," was representative.
- **Teaching effectiveness:** Students felt the instructor's approach to "teaching and presentation of materials made it easy for me to learn" (Mean of 4.4). Students enjoyed the "hands-on" aspect and being able to "get out and do things." Two students mentioned the program "started off like a

class," "being taught and told," and how they liked it better once they started using the software.
- **Pace:** Most students felt they had enough time (Q8), but 17% (2 of 12) did not (answered 1 or 2: strongly disagree or disagree). Several comments mentioned learning a lot but wanting more time.
- **Effectiveness:** All but one student answered "Agree" (4) or "Strongly Agree" (5) to the two questions about what they learned: whether they learned something in the class (Q11) and whether they are confident with what they learned after the class was completed (Q12). One student emphasized the point by saying, "It is on my resume." Another said, "I feel like I could teach someone else." Finally, based on the experience of going out and interviewing people, one student now has "more confidence talking to people I don't know."

Impact on Job Skills and Future Job Aspirations

Seventy-five percent answered "Agree" or "Strongly Agree" to whether they see themselves "getting a job where I can use the knowledge and/or skills gained through this course" (Q14). One student specifically mentioned wanting "to work with film when I get older," another "wants to be a producer." In fact, making use of the skills that he learned and honed during the six-week program, one of the students has begun his own business as a wedding videographer. Another student has completely changed her career goals and now wants to become a producer of documentaries, film, and television. Before this summer she was planning on attending a two-year community college. Now, she has already begun investigating film schools in the area and researching their criteria for incoming freshman. Another student submitted the documentary in a competition for an artistic grant. More than 1,000 students applied and he was awarded the artistic grant.

CONCLUSION

Overall, the results are very positive. Put simply, the two immediate objectives of this ICT program were *to inform* and to have the students *perform*. Students needed to quickly learn film and production concepts as well as hands-on skills such as using a video camera and video editing software. TheLCG's MMS, or Mobile Media Studio, provided a field-tested set of hardware and software that is robust and reasonably easy to learn and use. TheLCG's curriculum, tested and refined over a number of years, provided an effective process for high-school-age

students (and even younger) to learn the conceptual foundation, the hands-on skills, as well as the communication, team-building, and design skills needed to create a high-quality video documentary within a few weeks. From the results of the end-of-the-class questionnaires and interviews, students were engaged and they enjoyed the many challenges of this course. As one student said, "It was fun and didn't seem like a hard job, just interesting."

In the long term, students took one large step towards succeeding in the 21st century by becoming more literate in both computers and computers' new language, digital multi-media. For the community, economic capital is enhanced through new job skills and career opportunities. Social and cultural capital grows by understanding new ways of expression and new ways to record and distribute history. For example, once people in a community know how to use digital video and audio they can create their own documentaries and Internet TV stations.

As a result of the successes of this pilot program, ABCD decided to redesign its University High School's computer lab into a full digital media production studio in which every computer is a Mobile Media Studio. In addition, some of the computers now possess professional music recording and DVD authoring capabilities. ABCD and theLCG are also exploring the creation of a dedicated room to be used for regular Internet TV and Radio broadcasts as well as music production.

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KEY TERMS

Community Informatics: The use of information and computer technologies (ICT) in communities in order to impact communities socially and economically.

Critical Thinking: An active and systematic cognitive strategy to examine, evaluate, and understand complex issues and personal choices, pose provocative questions, correctly frame and then solve problems, and make decisions on the basis of sound reasoning and valid evidence. This competitive edge requires both rigorous analysis and nimble imagination. (Definition based on www.centerforcriticalimpact.com/definitions.htm definition.)

Learning Style: An individual's unique approach to learning based on strengths, weaknesses, and preferences. Though experts do not agree how to categorize learning styles, an example of a categorization system is one that separates learners into auditory learners, visual learners, and kinesthetic (feeling) learners. (Definition based on e-learningguru.com/gloss.htm definition.)

Likert Scale: A rating scale, typically 1 through 5 or 1 through 7, measuring the strength of agreement with a clear statement. Often administered in the form of a questionnaire used to gauge attitudes or reactions. (Definition based on http://www.isixsigma.com/dictionary/Likert_Scale-588.htm definition.)

Multi-Media: The use of computers to present text, graphics, video, animation, and sound in an integrated way. Long touted as the future revolution in computing, multi-media applications were, until the mid-90's, uncommon due to the expensive hardware required. With increases in performance and decreases in price, however, multi-media is now commonplace. Current PCs and PC operating systems are both capable and specifically tuned in order to accommodate the rapidly growing demand for multi-media, especially in the consumer market. (Definition based on www.webopedia.com definition.)

Multi-Track: In traditional recording technology, the ability to layer multiple different audio signals at once. In MIDI software, the ability to layer numerous MIDI data streams, including multiple audio tracks, a video track, etc. (Definition based on http://www.cakewalk.com/tips/desktop-glossary.asp definition.)

Streaming Media: The process by which multi-media files (e.g., audio files, video files, and music files) are delivered through the Internet. Such files are often very large, tens or hundreds of megabytes in size.

Syncopation: A style used in order to vary position of the stress on notes so as to avoid regular rhythm. Syncopation is achieved by accenting a weak instead of a strong beat, by putting rests on strong beats, by holding on over strong beats, and by introducing a sudden change of time signature. This style of composition was exploited to fullest capabilities by jazz musicians, often in improvisa-tion. (Definition based on www.geocities.com/ BourbonStreet/Delta/4688/ glossary.htm definition.)

ENDNOTE

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Measuring the Maturity Level of a Community Portal

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INTRODUCTION

Social interaction is a fundamental to human beings. In an effort to facilitate social interaction, various tools and technologies have been designed and developed over the centuries to connect people and create better means of communication. Most recently, this effort has been directed at facilitating the interaction of communities that share a common purpose or interest. These communities are diverse and often involve individuals or groups that are not situated in the same physical context. The World Wide Web (WWW) has become an important tool in facilitating the interaction and communication between such communities. This is evident in the large number of online community Web sites, portals and forums that have proliferated in the last decade. These Web-based tools provide communities with an online space to exchange information, share stories and experiences, solve problems, discuss issues, and socialise regardless of their location. Portals, in particular, have become the most widely used interface for online communities to meet and interact (Lacher et al., 2001).

Despite the widespread use of portals by online communities as an interaction medium, the research in the area to date has mainly been descriptive (Millen & Patterson, 2002) or focused on general portal design issues (Mynatt et al., 1997). Our knowledge about community portals is limited and constrained by a lack of frameworks and models to explain how community portals are developed, used and sustained. As a first step towards extending our knowledge about community portals, this article presents a framework for measuring the maturity level of a community portal. The framework has been named the S3 model and can be used to assess the level of a maturity of an existing community portal. By applying the model to a number of different portals in the same domain, it is possible to determine the "current state of play" in that domain. The following section provides a background into portals in general, and described the S3 model and its potential applications.

BACKGROUND

Web portals are access gateways to the World Wide Web that integrate various information sources and services (such as search engines and directories) and usually provide users with the ability to customise the content, layout and navigation to suit their personal needs (Lacher et al., 2001). Portals can be categorised as either horizontal or vertical. Horizontal portals originally began as search engines. They are multifunctional spaces used for information, navigation, communication and e-commerce (Vermeij, 2000), and offer broad content to the mass market. Well-known examples of horizontal Web portals include yahoo.com and msn.com. Vertical portals, such as webmd.com and about.com provide content that is of interest to specific markets or demographic categories. Vertical portals are characterised by depth, rather than breadth, of content. Affinity portals are special types of vertical portals, which target specific segments of the market. However, they are designed to appeal to people's emotions, values and belief systems rather than interests and hobbies. For example, affinity portals have been developed for religious groups. Although Web portals are traditionally categorised by their content and intended audience, a special type of portal has become a topic of research interest because of its distinct community focus. It has been referred to as a community portal.

Portals that are specifically designed to provide resources and meet the needs of a particular community are known as community portals. Community portals are usually based on common interests shared by its users (also known as communities of interest). However, others are based on the geographical location of the users. These portals address the specific needs of a local community situated in a particular area (neighbourhood, town, city, area, region, etc.). Australia has pioneered the establishment of these portals through its One City, One Site (OCOS) program, which is the first of its kind in the world. The OCOS program reserves certain domain names specifically for the use

of local communities. Only a not-for-profit organisation that is situated in a particular geographical location and is cross representative of the general community in that location can apply for these domain names. The domain names take the form of www.locality.state.au. For example, www.melbourne.vic.au is reserved for a not-for-profit organisation that consists of members who reside or work in Melbourne. To apply for the domain name, the organisation must also be representative of residents and groups that are in the Melbourne area. The OCOS program is currently undergoing pilot testing, with three community domain names to be allocated in August 2004.

Benefits of Community Portals

The benefits of community portals are diverse and numerous. Millen et al. (2002) suggest that they can be grouped into three distinct categories: individual, community and organisational benefits. A community portal brings a number of social, cultural and business benefits to the individuals living in a particular community. Amongst the most important of these benefits are enhancing existing social relationships and creating new social, professional and business links between members of the community. This results in the creation of a familiar and supportive environment (Millen et al., 2002) and an inexpensive forum for community members to interact at any time, regardless of their location. The ultimate benefit of a community portal is an increased level of trust amongst members of the community (Millen et al., 2002), which will have a direct impact on the society at large because it will promote a general feeling of safety and security.

On a different level, a major benefit of community portals is the integration and interoperability of different community information resources and services (Lacher et al., 2001). This leads to breaking down barriers between people in the community, for example, disabled people or minority groups (City of Seattle, 2000) and a community asset for youth (in particular youth from low-income families) to break the poverty cycle (Spencer & Neil, 2002). Finally, the economic benefits to consumers and businesses, especially small to medium enterprises (SMEs), are a significant by-product of successful community portals.

Government Initiatives

To promote the benefits of community portals, the Australian government has created and implemented various initiatives in the last decade. Networking the

Nation (NTN) was the largest of these initiatives. As part of NTN, a Regional Telecommunications Infrastructure Fund (RTIF) was set up to improve telecommunications infrastructure, access to the Internet and mobile communications in regional areas, to develop educational and training programs and to promote strategies to develop regional telecommunications services (Networking the Nation, 2003). Initially, $250 million was allocated over a period of five years, starting in 1997, and an additional $214 million was injected in 1999 for further projects. Funding was allocated towards the development and establishment of community portals, amongst other projects.

Several components of the NTN program were concluded in June 2002, with further funding for these components suspended. By this time, more than 110 Web sites and portals had been set up using the allocated funds and of those, 37% were community portals (Collins & Eccles, 2002). Amongst these were the Mainstreet (www.mainstreet.au.com), an online community portal for Western Victoria; the New England North West Region portal (www.nio.com.au) to promote regional communities and businesses (New Connections, 2003); and Maranoa region's e-business incubator and portal (www.maranoa.org.au), which was described in a study by Lawley et al. (2001).

The One City, One Site program (described previously) is a more recent initiative specifically targeted at the establishment of community portals, whereby a set of geographically based domain names has been reserved for communities. The use of these domain names is restricted to portals that reflect the interests of a local community, including local businesses, tourism, historical information, cultural events, etc. This initiative has significant implications for the business, government, media and education sectors because of the potential economic benefits involved. As mentioned above, pilot testing is currently under way prior to progressive implementation across Australia.

Government initiatives such as the ones described above are essential if the full potential of community portals is to be achieved. However, they must be complemented by a body of knowledge about community portals in general. As a first step towards developing this body of knowledge, the S3 model has been proposed. The S3 model is a conceptual framework that can be used to assess the maturity level of a community portal, and subsequently determine the "current state of play" in community portals. Armed with an understanding of the current situation, government organisations and policy makers will be in a better position to develop programs and initiatives that are informed by actual events and developments in communities.

Figure 1. The S3 model of community portals

Withdrawal of major funding

SET UP
- Stakeholders
- Access constraints
- Management
- Governance policies
- Business plan
- Measures of success
- Content and design
- Infrastructure
- Technical implementation
- Evaluation
- Awareness and promotion
- Initial participation
- Funding

SURVIVE
- Participation by key stakeholders
- Promotion
- Build critical mass
- Transparency and accountability
- Social proxy
- Social capital
- Ease barriers
- Governance
- Content updates
- Evaluation
- Funding

SELF-SUSTAIN
- Regular participation by key stakeholders
- Existing critical mass
- Evolved social capital
- Common history
- Trust and loyalty
- Shared sense of ownership
- Fine tuned content and design
- Integration
- Evaluation
- Funding

Self-funding

THE S3 MODEL

The proposed model is based on three development phases of a community portal: the set up, survival and self-sustainability phase of the portal. We have named it the S3 model after these three phases. Each phase involves a number of social, technical, administrative and policy *dimensions*, however, the underlying dimension in the S3 model is funding: the set up phase requires the highest level of funding from the government, local businesses and the other community groups and stakeholders. During the second phase, the major providers of the funding (such as government programs) are progressively withdrawn as the portal moves towards the self-funding stage. If the portal is still operational after this withdrawal is complete, it enters the third phase-elf-sustainability. A graphical representation of the S3 model is shown in Figure 1. The use of colour in the model is intended to reflect the required funding, shifting from primarily government funded (black) to entirely self-funded (white). Each of the phases is described briefly in the following sections with reference to the relevant dimensions in each phase.

Set-Up Phase

The set-up phase involves the process of establishing the portal. The manner in which the set-up issues are re-

solved will affect the survival and sustainability of the portal in the long term. One of the critical issues during this phase is to identify the stakeholders in order to gain an understanding of whose needs the portal will serve and involve the stakeholders in the portal development process. This type of bottom-up community consultation, in conjunction with top-down government driven programs, will foster support for the portal from an early stage. A primary concern that needs to be addressed during this process is that of access constraints to find out if there are any stakeholders who are prevented from participating in the portal because of being unable to access the Internet. Access constraints need to be resolved before or in parallel to the establishment of the portal. The Community Technology Centres (CTC) program, an initiative of the New South Wales government, was designed to overcome access constraints by funding the building of multi-purpose computer facilities in the main centre of rural towns. In addition to Internet access, these facilities have various other facilities such as teleconferencing services and e-commerce incubators.

During the set-up phase, planning and management issues are of critical importance. These issues must be resolved prior to any technical implementation of the portal. For example, the OCOS program stipulates that a not-for-profit organisation consisting of a cross-section of the local community will manage commu-

nity portal. Therefore, it is necessary to ensure equitable representation of the key community interest groups and stakeholders. Although the OCOS program does not indicate the specific objectives of the organisation, it can be argued that the members of the organisation will have a key role in the development and enforcement of governance polices (Preece, 2000) relating to the use of the portal and make decisions about the day-to-day management of the portal, including appointing a portal moderator. However, one of the main roles this organisation should have is participation in the development of the business plan which underpins the portal. A business plan is critical if the portal is to become a self-sustaining entity and should contain relevant measures and benchmarks of success.

The actual content and design of the portal must address the needs of the key stakeholders and adhere to basic usability principles (for example, Nielsen's (1994) usability heuristics). The content and design issues must be addressed before the technical implementation of the portal, which involves the actual development of the Web site and setting up the required physical infrastructure. Evaluation is central to the design of successful systems (Hartson & Hix, 1989) and key stakeholders should evaluate the portal before it is launched and promoted in the community. Lacher et al. (2001) found that a portal, which allowed members to create and update Web pages easily and quickly was needed.

Uslaner (2002) argues that the Internet is an excellent alternative medium for people who already have something in common or an "off-line" community. Creating awareness about the portal and encouraging initial participation are the foundations for stimulating online interaction and instigating a critical mass. Taylor and Marshall (2002) state that more established social groups and networks make better use of the Internet, suggesting that the existence of an "off-line" community is important. These "off-line" communities and social networks may form the core of the critical mass which is crucial to the survival of the community portal, especially because funding from government programs does not continue indefinitely and most of it will be spent during the set-up phase. It should be noted that various research has shown that external funding does not translate into survival and sustainability of a portal (Taylor & Marshall, 2002; Denomme, 2001).

Survival Phase

During the survival phase, the community portal must demonstrate that it is able to outlive the withdrawal of government funds which, in the case of the NTN initiative, happened after five years. However, as suggested previously, the majority of the funds will have been spent to develop and implement the portal, therefore, the lack of a reliable source of funding may occur much earlier than five years. In order to survive, the community portal requires regular participation by key stakeholders, and especially local businesses. Local businesses, and small to medium enterprises (SMEs) in particular, will have an increasingly important role in sustaining the funding of the community portal through advertising and the implementation of e-commerce. However, the main issue during this phase is the development of social capital and social proxies.

A social proxy is a method of embedding social cues (Donath, 2002) and visualising the social interaction at the interface (Erickson et al., 2002). Examples of social proxies that have been implemented and tested are Babble (Erickson et al., 2002) and PeopleGarden (Donath, 2002). Social proxies enable community members to observe others during group interaction online and therefore maintain transparency and accountability in the social network. This in turn results in promoting trust between the members of the community and building the critical mass required to sustain the community portal. Millen and Patterson (2002) also suggest channelling conversation through common areas on the portal and facilitating specific discussion topics as ways of social engagement among members. The build-up of a critical mass is attractive to local businesses because it represents a target marked. A study by Lawley et al. (2001) has shown that business participation and, in turn, consumer use of the portal are critical to the success of the portal because ongoing participation ensures regular content updates which in turn attracts more members to the portal. This cyclical sequence will ultimately lead to self-sustainability.

Self-Sustaining Phase

The community portal becomes self-sustaining when important levels of participation of key stakeholders are achieved. This includes participation by residents, local businesses, government organisations and educational institutions. Community portals at the self-sustaining phase will have advanced e-commerce models in place and members of the community will have an evolved group-consciousness based on a common history, trust, loyalty and a shared sense of ownership of the portal. It is also possible that, at this stage, an integration of different media and devices can be used to extend the community portal through the use of, for example, multimedia message services (MMS). At this stage the portal is entirely self-sustaining and becomes a vital resource for the stakeholders in the community.

APPLYING THE S3 MODEL

Based on the description of the three community portal development phases above, a review of an existing portal would entail assessing the community portal on each of the dimensions in each phase to determine the maturity level. This can be done by examining the portal itself, as well as by conducting a survey of the portal users and administrators, and analysing any relevant documentation. Data needs to be collected as evidence for each of the dimensions within a phase, starting with the set-up phase. For example, the existence of suitable governance policies would have to be verified in the set-up phase, amongst other things. Depending on the extent to which the dimensions for each phase have been addressed, a maturity level of a community portal can be arrived at on a continuum as shown in Figure 2 below. By carrying out a review of all the existing community portals in a particular domain (e.g., in Australia), a cumulative maturity level can be determined as an indicator of the "current state of play." This can be done by identifying clusters on the continuum. An example of how the model has been applied in the Australian context is described in the following section.

The S3 Model in the Australian Context

Initial desk research identified 23 established community portals in Australia for review. These portals were viewed and where possible the researchers registered with the portal to get hands-on experience with how the portal operated. During this process, specific information about each portal was collected and Web administrators were contacted if the information was not available on the portal itself. The type of information collected included: the date established, aims and/or mission, portal category, the number of members registered, as well as measures of community portal activity

levels (e.g., number of hits, number of postings, any revenues earned, etc.). This information enabled us to undertake a preliminary analysis of the current state of play using the S3 model.

In the first instance it is interesting to note that many of the Web administrators e-mail addresses were either not available or non-functional. As a result the generic e-mail "info@…" or telephone were used to contact the administrators where necessary. Most of the Web administrators were part-time staff that managed the portals as a voluntary commitment. Some of the community portals were managed either by the portal owners or by an outsourced agency. It was also evident from the information collected that most of the portals were supported by government funded grants, or funding from local businesses. However, none had a defined and successful revenue model and it was increasingly evident that most of the portals were either existing by virtue of the availability of infrastructure to host or had very low cost for continued presence. In the majority of the portals, the number of visits (or the portal traffic) followed a bell-shaped curve with numbers initially growing (presumably as a result of initial curiosity by community members) and later diminishing.

It appears, therefore, that the majority of Australian community portals reviewed are on the cusp of the set-up and survive phases, since most were leaving the set-up phase but struggling to survive (as shown in Figure 3). Attaining the self-sustain phase remains a major endeavour for these portals. Only one of the reviewed community portals has been impressive in terms of providing ownership to the community by way of self-updating content about community activities paving the way for self-sustainability as activity levels on the portal grow. It was also interesting to note that portals run by Internet Service Providers (ISPs) are viewed more as a means for the ISPs to sell their services and have a presence in the local region of their operation, rather than out of any desire for community development.

Figure 2. Continuum of community portal maturity levels (with examples)
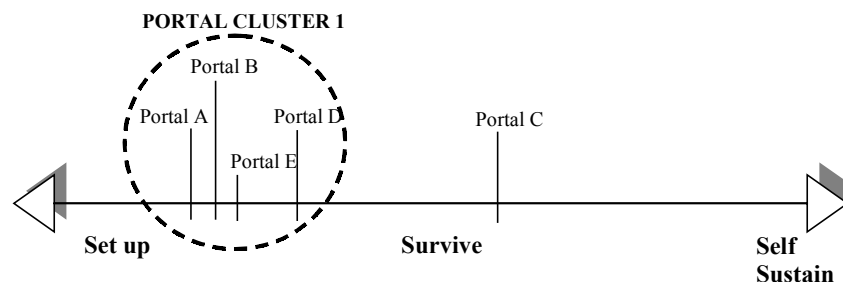
Figure 3. Current state of play of 23 Australian community portals
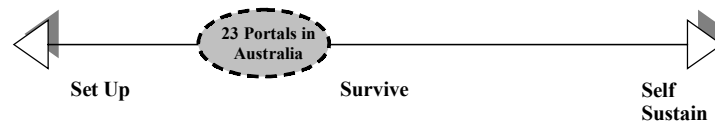
FUTURE TRENDS

As community portals continue to proliferate and grow worldwide, they become increasingly important community resources and provide forums for communities to interact. It is important to provide support to community portals in order to facilitate their growth and development. This support can be in the form of government initiatives such as the ones in Australia (described previously). However, any support provided to community portals must be underpinned by current knowledge and research about community portals. This includes research about the different types of community portals, their use, critical success factors, management issues and self-sustainability concerns. Simply providing support in the form of funding is inadequate if the funding is not strategically directed towards specific aspects of community portals. The S3 model described here, serves as a useful tool for analysing the maturity level of a community portal and can be used to inform government initiatives and policies. It also highlights key issues or dimensions that a community portal needs to consider and address throughout its development. The pilot testing of the OCOS program (which the authors are involved in) has brought these dimensions to the surface and reinforced the S3 model and its usefulness. Further research is currently under way to develop and empirically evaluate the S3 model.

CONCLUSION

Developing strategies to promote the growth and development of self-sustaining community portals initiated at a "grassroots" level to serve the needs of a community has become an important agenda item for government organisations and researchers alike. Rather than the top-down approach driven and governed by government funding initiatives alone, an integrated top-down and bottom-up approach is required, driven by research into actual community needs. To support this integrated approach, it is important to have a transferable body of knowledge about community portal design, development, implementation and sustainability. The S3 model was developed for this purpose. Using the S3 model to analyse the "current state of play" enables researchers

and policy makers to gain an in-depth understanding of how community portals are being developed and used, as well as how they are maturing. This is a critical first step in creating a transferable body of knowledge about community portals. The S3 model can also be applied in practice a basis for developing community programs and initiatives that are informed by actual events and developments in real communities.

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KEY TERMS

Affinity Portal: A special type of vertical portal that targets specific segments of the market and is designed to appeal to people's emotions, values and belief systems.

Community: A group of people related to each other by shared purpose, goals or interests, situated in a shared spatial, social or cultural context, whose interaction is voluntary and governed by a set of social conventions.

Community Portal: A portal that is designed and developed to provide access to community resources and serve community needs and interests.

Horizontal Portal: A multifunctional space used for information, navigation, communication and e-commerce that offers broad content to the mass market.

Portal: Access gateway to the World Wide Web (WWW) which integrates various information sources and services and usually allows users to customise the content, layout and navigation to suit their personal needs.

S3 Model: A conceptual framework for measuring the maturity level of a community portal.

Self-Sustainability: The ability to maintain an entity over an extended period of time without depleting the resources available to it.

Vertical Portal: A portal providing content that is of interest to specific markets or demographic categories.

Medical Education in the 21st Century

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INTRODUCTION

As with many disciplines, the fields of healthcare in general and medicine, in particular, have made vast strides in improving patient outcomes and healthcare delivery. But, have healthcare professionals and medical academia been able to maximize the utilization of new technologies to improve the delivery of the right knowledge, to the right people, at the right time across geographical boundaries? In order to provide the best quality of care, regardless of patient or provider location, specific issues must be addressed.

Healthcare consumers and providers recognize that the system is often over worked, time constrained, poorly funded and desperately in need of a means to maintain up-to-date knowledge and efficient skills in order to deliver the best quality of care (Health Canada, 1998). We also know that there is a large disparity in both the quality and types of healthcare available between developed and developing countries (Lown, Bukuchi & Xavier, 1998). Within a single country there are also differences in healthcare services based upon location (rural vs. urban areas), wealth, age, gender and a host of other factors (Health Canada, 2004). However, because Information and Communication Technologies (ICT) can be a simple and cost effective tool, it can make desperately needed medical knowledge available to developing countries (Pakenham-Walsh, Smith & Priestly, 1997). Furthermore, it is becoming more difficult to get physicians and extended healthcare professionals to participate in face-to-face seminars in order to learn about the progress and changes in the delivery of healthcare. Time, travel requirements and cost are the biggest barriers to overcome. For rural areas and developing countries these issues are even more evident (Ernst and Young, 1998). Today, many institutions and countries are exploring and implementing ICT solutions to help reduce these inequities. The fact remains however that in the case of developing countries, a critical shortage of healthcare professionals remains (Fraser and McGrath, 2000). Adding to the problem is the fact that the telecommunications network, the backbone of ICT, in Africa is the least developed in the world (Coeur de Roy, 1997)

This article concentrates on two main aspects of ICT. First, it examines ways in which ICT can assist in information and knowledge transfer and second, it explores the challenges of ICT implementation.

ICT AND ITS ROLE IN MEDICAL EDUCATION

Providing the right medical knowledge and training to healthcare professionals can be a challenge in the best of circumstances. In developing countries dissemination of the best clinical practice protocols at an affordable cost regardless of the location of the targeted audience is even more daunting. While technology such as CD-ROM-based learning can be tremendously efficient in helping medical students learn fast and well, there may be a lack of individual access to the necessary infrastructure such as equipment and power. In these cases the material is often used in classrooms and the goal of facilitating individual learning and allowing students to go at their own pace may not be met (Pakenham-Walsh, 2003). It is important to keep in mind that even developed countries have, in spite of relatively easy access to the necessary technology, difficulties in properly managing its introduction and use in medical schools (Greenhalgh, 2001).

Tele-education can help in reaching remote communities in developing countries. However, in many regions, technological compatibility and training remain a challenge (Pakenham-Walsh, 2003). The birth of the

Internet, in spite of its many imperfections, has dramatically changed the way information, communication and learning are delivered. Although there still exists an imbalance (Davison, Harris, Vogel & Vreede, 1999), in many ways the Internet Age can reduce the gap between developed and developing countries in terms of access to all types of information (United Nations ICT Task Force-1, 2004). While the full potential of the Internet as an ICT tool has yet to be defined it does allow access to information at a speed, quality, and cost previously unseen and defies the notion of geographical boundaries. The Internet allows access to medical information through online articles, video presentations, videoconferences, e-mail-based information and communication. Today, a medical student or healthcare practitioner in India, Africa or any developing country can gain access to the latest medical information from around the world. This new reality has set the foundation for a truly worldwide medical and healthcare community of practice. However, the lack of technological infrastructure and training in developing countries can affect the delivery and use of this health care information (Lown et al., 1998).

As mentioned earlier, users of ICT in the healthcare field face many challenges. Yet despite these challenges, we are at the beginning of a marvelous adventure that has the potential to create a healthcare arena for all with unrestricted access to information and knowledge for practitioners around the world. While this could be viewed by some as simple, utopian rhetoric, the group "Doctors without Borders (Medecins sans Frontières)" already demonstrates the willingness of medical communities to create a vast exchange of information and knowledge (Orbinski, 2000). The term "doctors without borders" captures the spirit of the new world order and sets the future stage for sharing healthcare information. This growing global community of healthcare workers may bring about the desperately needed improvement in the availability of healthcare information around the world (Jareg & Kaseje, 1998).

Despite the great potential, we need to both understand and address the limitations of ICT as a tool in the acquisition and transfer of information and knowledge. The Achilles' heel of the ICT user is not, in our opinion, in terms of access to information, but rather in terms of prior training in healthcare, possession of the necessary technical skills, and an efficient infrastructure (United Nations ICT Task Force-2, 2004). These are the basic requirements in understanding and transforming the rich information that is available into meaningful and useful medical knowledge. When the introduction of ICT is paired with proper access and training, it can lead to the successful creation of a community ready, willing and able to use the ICT to its fullest extent possible (United Nations ICT Task Force-2, 2004).

While such a community can create, share and apply important healthcare knowledge on a wide range of issues, it has to be done accurately and in a timely manner in order to be beneficial (Using ICT to Empower Communities, 2003).

An additional benefit of ICT is the degree to which it can help reduce the sense of isolation often felt by healthcare professionals, especially in rural areas. As a result, staff morale can be improved (Using ICT to Empower Communities, 2003; Ballantyne, 2003).

At this point, the question arises: Can a viable knowledge community exist through the use of ICT?

Before answering, one must differentiate between ICT as a tool on the one hand and the knowledge it can help foster and transfer across boundaries on the other hand. Unlike Marshall McLuhan, who stated that the medium was the message (McLuhan, 1994), we say that ICT is not the knowledge, but only its channel.

FOSTERING A KNOWLEDGE COMMUNITY

Up until now we have discussed the use of ICT as a method of sharing information and knowledge. However, there are conflicting opinions regarding the differences between information and knowledge and the transferability of knowledge (Wilson, 2002).

Exploring the Definition of Knowledge

What is knowledge? How can it be defined? These questions have been posed for thousands of years and answered with varying degrees of clarity. Plato described knowledge as justified true belief. Other definitions have been as simple and direct as what we know (Wilson, 2002), or as detailed as a mix of experience, values, information and insights that are applied in the minds of individuals as well as embedded in organizations (Davenport & Prusak, 2000).

Related to knowledge, but not interchangeable, are data and information. Although they are sometimes used interchangeably with each other and with knowledge, they are different. Data is considered the most basic level of discrete facts. Information is more sophisticated than data in that it is a set of related facts. Both data and information, while important, are not knowledge. They generally have no meaning attached to them and they are much more likely to be objectively measured and agreed upon by those preparing and using them. They are also likely to be more generally available than knowledge.

While related to each other, these three concepts are

Diagram 1. Hierarchy of knowledge creation and sharing within a community
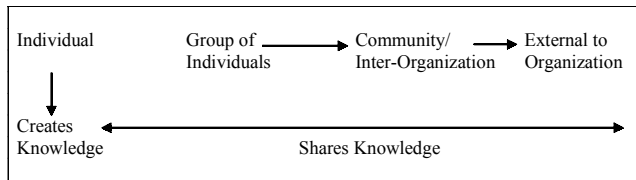
not interchangeable. Rather, there is a hierarchy. It is possible to have data and information without knowledge but *it is not possible to have knowledge without data and information.*

If there is no knowledge without first having access to data and information, then ICT, by allowing the transfer of data and information anywhere, anytime, allow individuals across the world to have the fundamental resources needed for the creation of knowledge. This makes ICT a critically important aspect of knowledge creation and transfer.

Diagram 1 describes a hierarchy of knowledge creation and sharing within a community. Note that knowledge also flows back to the individual.

In this paradigm, ICT, although not perfect, becomes the arteries of a mega community linked by these common objectives.

Classical medical education activities delivered through traditional means such as seminars, perceptorships, residency programs, and workshops seem quite inefficient and costly, poorly coordinated, supply driven, and the content of the information and learning provided is frequently not relevant to the diverse needs of today's rural healthcare workers, especially in the third world (Ballantyne, 2003).

ICT, by allowing healthcare professionals to interact together and with the public, can dramatically change the way medicine is practiced by allowing the timely and unlimited exchange of an ever-increasing quality and quantity of information and knowledge. The role of ICT in the healthcare domain has been so important that in some countries, such as Malaysia, it has been regulated and important financial and material support is provided (Minges & Gray, 2004). The number of online programs of continuing medical education has, for example, increased by 110% in 1999 compared to 1998 (Reynolds, 2002). This shows a definite trend towards the acceptance and use of ICT in the field.

In addition to providing fast and easily accessible information, ICT helps create ties across geographical borders. When asked about their expectations of the use of ICT, healthcare professionals ranked sharing of infor-

mation and experience number one (Roundtable on ICT for Continuing Medical Education, 2003). The act of sharing helps to create a deeper sense of community (Bwalya, 2003; Grunwald, 2003; Roos, 2001).

Moreover, when it comes to poorer and rural areas, ICT can assist in reducing costs by minimizing redundancy and mismanagement of treatment by enabling healthcare professionals to have readily available clinical information about their patients. An economic argument can be made for greater use of ICT tools in that it will lead to more efficient use of available healthcare resources (Denz, 2003).

In rural areas of developing countries, the successful implementation of ICT requires addressing the management, maintenance and user support issues (Verboom, 2003) which are obviously important aspects and may be easier to deal with in cities and developed countries.

ICT has completely and forever changed the way healthcare education can be delivered (Finkelstein, 2003; Greenhalgh, 2001).

In order to be successful, the use of ICT tools in the healthcare field must be driven by a vision and by policies that recognize the potential. As well, the involvement and buy in of the multiple stakeholders-medical academia, governments at national, regional and local levels, and healthcare practitioners and consumers is critical.

CHALLENGES FOR ICT IN DEVELOPING COUNTRIES AND RURAL AREAS

Table 1 summarizes some of the critical ICT issues faced by developing countries.

The inequities described in Table 1 undoubtedly create a digital divide (Cullen, 2003) making an efficient use of ICT difficult in developing countries (Moghaddan & Lebedeva, 2004). In healthcare, this is unacceptable as it could mean the difference between life and death. Healthcare professionals as a community without borders must be accepted and supported and ICT tools must be developed and made available by international agencies. Access to information is instrumental to the success of healthcare systems in developing and transitional economies (Pakenham-Walsh, 2000). In developed countries however, resistance to change seems to be the main issue where older generations of healthcare professionals are less familiar with the use of ICT and sometimes prefer not to use them (Peterson, 1999).

Table 1. Critical ICT Issues Faced by Developing Countries

-Scarcity and/or costs of telephone lines
-Unreliability of telephone lines and Internet connectivity
-Lack of skilled workers to properly use the technology
-Lack of vision and support from policy makers
-Political instability leading to:
 	
       Prohibitive costs
       Poor infrastructure
       Poor funding
       Electricity shortage
 	
-Low priority for ICT against the urgent need to spend the money on medication instead

CONCLUSION

ICT tools are indispensable in providing desperately needed information and knowledge to healthcare professionals regardless of their geographical location. Much has been done and, while improvements continue, more remains to be accomplished (Dash, Gowman, Traynor, Jones & Tait, 2003).

The creation of an international task force to encourage access to ICT tools by healthcare professionals across the world is essential. It will help reduce the gap in medical knowledge, improve infrastructure and quality of care among rural and urban areas as well as amongst developing and developed countries. Quality of care should become a right, not a privilege. We must always keep in mind the patient and improved patient outcomes on a worldwide scale (Towle, 1998).

We believe that healthcare ICT communities will be instrumental in achieving this objective.

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KEY TERMS

CD-Rom (Compact Disc Read-Only Memory): Optical data storage medium using the same physical format as audio compact discs, readable by a computer with a CD-ROM drive.

CME (Continuing Medical Education): All learning by healthcare providers, after basic training.

Community: A unified body of individuals, people with common interests living in a particular area.

Digital Divide: The phrase has been applied to the gap that exists in most countries between those with ready access to the tools of information and communication technologies (ICT), and those without such access or skills.

E-Health: Used to characterize not only "Internet medicine," but also virtually everything related to computers and medicine.

Information Technology (IT) or Information And Communication Technology (ICT): The technology required to convert, store, process, transmit, and retrieve information.

Internet, The: The vast collection of interconnected networks that all use TCP/IP protocols.

Preceptorship: Teaching or tutoring.

System: A group of devices or an artificial objects or an organization forming a network, especially for distributing something or serving a common purpose.

Telehealth: The use and transmission of video, voice and text data for a multitude of health–related issues, including, health management, patient care, and health worker training and education, individual and patient education on health maters.

Mobile Ad Hoc Networks

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INTRODUCTION

The history of computer networks can be traced back to the early 1960s, when voice-grade telephone networks dominated the communication networks. With the increasing importance of computers, as well as the ever-increasing expense of centralized mainframe computers that were growing in size, there was a need to decentralize computer systems. This trend also highlighted the need to connect computers together, by means of computer networks, so that their capacity could be shared among geographically distributed users. Unlike the circuit switching telephone networks, where voice is transmitted at a constant rate between sender and receiver, the traffic in computer networks tends to be bursty. To meet the requirements of data communications, people began to invent more efficient and robust networks, i.e., packet switching networks. The first published work on packet-switching techniques was that of Leonard Kleinrock (Kleinrock, 1961, 1964). The first packet-switching computer network called ARPANET was developed in 1969 and then became the ancestor of today's public Internet (Kurose & Ross, 2001).

Over the last 30 years, the Internet has existed as a network with a fixed infrastructure that consists primarily of local area networks (LANs) interconnected via gateways or routers. However, such technology does not consider the requirements of mobile users, where locations of machines or even network topology may frequently change. With the increasing utilization of mobile devices such as laptops, PDAs, etc., as well as the development of wireless LAN technology, the next challenge was to be able to roam, i.e., be connected anywhere, anytime, within a connected environment. Mobile Internet protocol (IP) was designed to support such mobility through location management, tunneling, and security mechanisms (Macker & Corson, 1998). However, such solutions still relied on a fixed infrastructure. However, there are many important applications that cannot rely on the existing infrastructure. Typical examples include rapidly deployable battlefield networks, disaster relief management, wearable computing, virtual conferencing, home networking, sensor networks, personal area networks, etc.

Mobile ad hoc networking provides a useful technology to address this problem. Mobile ad hoc networking research was initiated nearly 20 years ago by the U.S. Government, including the Defence Advanced Research Projects Agency (DARPA), the U.S. Army, and the Office of Naval Research (ONR) (Macker & Corson, 1998). Ad hoc networks are autonomous networks operating either in isolation or as "stub networks" connecting to a fixed network. They do not rely on any existing infrastructure. There is no centralized authorization entity, such as central server, firewall, or router. Each node serves as router and forwards packets for other nodes in the network. The nodes may be located anywhere, such as in airplanes, ships, vehicles, or even on people. The nodes are normally equipped with wireless transmitters and receivers using antennas. The topology of the network continuously changes, which is in contrast with the static topology of existing Internet. There have already been several popular ad hoc networks including IEEE 802.11, Bluetooth, HomeRF, etc. (Othman & Xue, 2002). IEEE 802.11 wireless LANs are the fundamental components for most mobile technologies. Its position is very similar to that of the wired Ethernet. In 1997, the IEEE 802.11 standard was formed and involves the medium access control (MAC) and physical (PHY) layers for a wireless network connectivity. Subsequently, a family of IEEE 802.11 standards have been created ranging from 802.11a to IEEE 802.11 i. The difference among these standards is mainly in operational band and data rates (Wave Report, 2004). 802.11a, b, and g are the most popular WLANs. 802.11a operates in the 5 GHz band with data rate up to 54 Mbps. 802.11b operates in the 2.4 GHz band with data rates up to 11 Mbps. 802.11g is developing a higher-speed PHY extension to the 802.11b standard, while keeping backward compatibility with the 802.11b standard. The target data rate is at least 20 Mbps (WAVE Report, 2004).

Apart from the evolution of 802.11 that is based on networking technologies focusing on the MAC and PHY layers, another technology, Bluetooth, is becoming the most popular networking technology. Bluetooth tries to connect all kinds of devices, such as printers, computers, mobile telephones, digital cameras, PDAs, etc., without cables (Haartsen, Allen, Inouye, Joeressen, & Allen, 1998). Ad hoc network technology is the key to realizing our dream of communication anywhere, anytime, and will have a great impact on our future.

CRITICAL ISSUES OF AD HOC NETWORKING TECHNOLOGIES

Ad hoc networks have many benefits, such as self-reconfiguration and adaptability to highly variable mobile characteristics, such as power and transmission conditions, traffic distribution variations, and load balancing. However, such benefits come with some new challenges, largely due to the unpredictability of network topology resulting from the mobility of nodes. Although ad hoc networking technology has been developed over 20 years and has shown great promise, there still exist many open problems. The following sections will discuss several critical issues.

Security

An ad hoc network is a collection of mobile nodes without the requirement for a centralized control systems or fixed infrastructure. Security has become a primary concern in ad hoc networks because of the inherent poor quality of wireless mobile networks and the lack of centralized control mechanism. The wireless channel is accessible to malicious attackers. Without centralized control systems, there is no suitable place where traffic monitoring or access control mechanisms can be deployed. Consequently, there is no boundary between inside network and outside world. In fact, many existing ad hoc routing protocols such as Ad Hoc On Demand Distance Vector, the Dynamic Source Routing, and wireless MAC 802.11 protocols assume a trusted and cooperative environment. This provides a significant opportunity for an attacker to become a router and disrupt network operations by intentionally disobeying the protocol specifications (Yang, Luo, Ye, Lu, & Zhang, 2004). Furthermore, portable devices are vulnerable to compromise or physical capture, which may provide access for attackers to sneak into the network through these subverted nodes (Yang, Luo, Ye, Lu, & Zhang, 2004; Othman & Xue, 2002).

Routing

As the topology of an ad hoc network is, by definition, constantly changing, it is very difficult to route packets between any pair of nodes. Multicast routing is also difficult, because the multicast tree is no longer static due to the random movement of nodes within the network (Hong, Xu, & Gerla, 2002).

Quality of Service (QoS)

The random nature of communication within ad hoc networks makes it very difficult to guarantee the quality of

service (QoS) offered to a device. Also, for portable mobile terminals, limitations on power consumption pose a constraint on the storage and processing capacity of the device, which further reduces the capacity to maintain a high QoS in an ad hoc network (Lee & Lee, 2002; Raju, Hernandez, & Zou, 2000; Sivakumar, Sinha, & Bharghavan, 1999).

CONCLUSION

Ad hoc network technology is the key to the realization of the dream of ICT anywhere, anytime, and is likely to have a great impact on our near future. This article has introduced the technology and discussed some of the implications and challenges it poses to the community. Several critical issues have been discussed. Among them, security is the most important, as using the wireless ad hoc networking environment makes networks vulnerable to unsolicited attacks. Cryptographic mechanism is still the basis for secure membership management, secure routing, prevention of eavesdropping, etc.; but it cannot help other issues commonly available in traditional networks, such as denial of service (Buttyan & Hubaux, 2003; Manikopoulos & Ling, 2003). For QoS in ad hoc networks, QoS-based routing seems to offer a promise to meet end-to-end QoS requirements (Aggelou & Tafazolli, 2001). However, such an approach cannot deal with hand-off very well. Although the current development of mobile ICT has not yet completely solved all the critical issues, it is still feasible to deploy current mobile technology to some simple application scenarios that have low security requirements, such as routine conferences and regional community development applications, etc. However, current technology development for mobile ICT has great application for many regional community needs, and this sector will benefit a great deal from exploration of its potential.

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KEY TERMS

Bluetooth: A communications protocol designed to enable mobile devices to share information and synchronize data. This technology requires a transceiver chip in each device.

IEEE 802.11: A family of IEEE standards for wireless local area networks.

Mobile Ad Hoc Network: A wireless network that does not have a centralized unit.

Multicast Routing: For the service of delivering one message to multiple destinations over the computer networks. One such application is the news group.

Networking/Internetworking: A technology of interconnecting more than one network. In most cases, those networks are different in terms of hardware and software characteristics.

Router: An Internet working device that connects two computer networks. It does the job of resolving difference between two interconnected computer networks.

Routing: The determination of a path that a data packet will traverse from source to destination.

Mobile E–Work to Support Regional and Rural Communities

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INTRODUCTION

Telework, or e-work as it is now more frequently called in Europe, means working outside one's regular workplace, utilising sophisticated ICT. E-work is an alternative form of organising work, a "love child" of the information society. E-work manifests itself in numerous forms and modes. These various solutions emerge as an evolutionary process along with the technological developments, economic pressures, and changes in socio-cultural patterns such as new information-age lifestyles (e.g., Castells, 1996; Heinonen, 2000). E-work can be carried out at home, in a telework centre or at any other facility. It can also be done as a mobile mode on a train, bus or some other vehicle, as well as at airports, railways and bus stations-in other words on the move from one place to another. Such mobile e-work is primarily increasing, owing to technological and social developments. ICT has become smaller in size, more portable and more efficient.

MOBILE E-WORK AS A SOCIAL INNOVATION

Mobile e-work is, however, not only a result of technological breakthroughs and penetration of ICT equipment in society. It is essentially a social innovation where various goals coincide. First, it may ease the stress of working life when the long commuting hours can be used for reducing the work load. Second, it is an instrument for employers to recruit people from a wider geographical area. Last, but not least, the implications of mobile e-work on regional development and rural communities must be taken into careful consideration (Heinonen, 2001). Along with various obvious benefits that are to be expected from e-work, prejudices persist and obstacles are still abundant (e.g., Anderson et al., 1996). Mobile e-work as a social innovation primarily awaits a breakthrough of the trust culture in working milieus.

The data available on the numbers of e-workers is somewhat unreliable and incomparable. This is largely because various surveys measure e-workers' numbers using different criteria or definitions. Mobile e-work is a recently new phenomenon in the field of e-work in general. Therefore, it is particularly difficult to get statistical data on relevant numbers of mobile e-workers. Some figures can be given, though. The number of teleworkers varies from country to country within Europe. Scandinavia and Finland have the highest proportion of teleworkers out of the total number of white-collar workers, as a result of low-cost technologies, legislative frameworks, and corporate culture. IDC Research has forecast that the number of teleworkers in Europe will increase to over 28.8 million by 2005, up from 10 million in 2000. According to IDC, the mobile workers are defined as those who spend at least 20% of their working hours away from home, their main place of work, or both. There will be over 20.1 million mobile workers in Europe by 2005, up from 6.2 million in 2000 (Jüptner, 2001).

Various models and practices on e-work were developed, tested and recommended for communities and regional authorities in a recently completed three-year research project on Eco-Managed Introduction of Telework, carried out at VTT Building and Transport (Heinonen et al., 2004; Heinonen, 2001). The perspectives chosen were an analysis of environmental impacts, as well as a scrutiny of socio-cultural implications from various e-work contexts (for environmental impacts see also Arnfalk, 2002). A case study was included to experiment with mobile e-work in the Regional Council of Häme, Finland, which will be presented further in this article in more detail.

Mobile e-work can be seen as a means to bridge up the gap between regions. The general processes of centralisation and urbanisation are shifting emphasis on metropolitan areas and a few other urban growth areas. Other regions continue to lose their educated young brainpower to cities, and struggle with economic hardships. By promoting e-work and especially mobile e-work, the regions could have more balance in a socio-economic sense. The skilled labour could remain living in rural regions or semi-urban communities if their employers permitted e-work as a way to organise their work and commuting. In a traditional e-work case, an employee e-works one or two days per week at home or at a nearby telework centre, while on other days he or she commutes to the main office. Mobile e-work adds relevant benefits to the traditional e-working. In mobile e-work,

trips to and from work can be used for working and thus the working hours at office will be cut down correspondingly.

In regional development, legislative efforts to diminish the digital divide between cities and rural areas could include, for example, tax deductions to the companies that permit mobile e-working, as well as to the employees who regularly practice mobile e-work.

E-WORK AS A TOKEN OF MOBILE LIFESTYLE?

In a survey by the Helsinki Metropolitan Area Council (YTV), the results showed that a typical e-worker in the Helsinki Metropolitan area is a highly educated and well-off male employee, younger than an average (YTV, 2001; Heinonen et al., 2004). He lives in a detached house, drives a personal car to the office and has a longer distance from home to the job than on average. Does this imply that an e-worker is prone to more mobility when trips to work are reduced? Or is the diminished commuting a quality-of-life target for a person who is already accustomed or obliged to undertake much travelling? In this survey, 3.6% of all the respondents claimed to have teleworked on the day the questionnaire was administered. Of the respondents active in working life, more than 5% teleworked at least one day per week and 13% replied to have teleworked occasionally during the last six months.

Mobile e-work is understandably more natural to persons with a mobile or nomadic lifestyle. They are already accustomed to embracing continuous change of place and perhaps more easily concentrating on working on the move than those persons who consume their energy on the act of moving from place A to place B.

MONITORING MOBILE E-WORKING CONDITIONS

Mobile e-work was launched and tested in the case of Regional Council of Häme in 2002. Two employees working in Hämeenlinna, the oldest inland town in Finland, were selected to participate in the experiment. Their one-way commuting times were 1 hour 15 minutes and 1 hour 45 minutes by train, respectively. For three months, it was monitored by questionnaires and detailed diaries how well a daily commuting trip on train was suitable for e-working by using a portable computer and mobile telephone. The employees signed special contracts of e-work where it was agreed to compensate their working time on the train by reducing the normal

working hours. They were also asked to carefully write down any advantages, obstacles, and observations that might be relevant for the outcome of mobile e-work.

The seat reservation for ICT seats was considered very important. Such seats were equipped with ICT plugs for portables, and they were isolated from other passengers by a glass wall. Thus, peace for e-working was guaranteed unless the other person sitting in such a compartment was talkative or otherwise disturbing the working conditions.

The main benefits from this experiment on mobile e-work were the increased efficiency of working, the decreased sense of stress, the enhanced working motivation, and the improved quality of life. The employees had more time to their families, hobbies and leisure time. They did not have any pressure to move their homes nearer to their office (Heinonen et al., 2004). The main issues that still need more developing as regards e-working conditions were too small table space, and occasionally too weak field access for mobile telephones. The data security also needs more thorough attention. Even the best data security procedures are not sufficient if someone simply robs the e-worker's computer "on the road."

FUTURE CHALLENGES

Besides the promising potential of mobile e-work in support of the development of regional communities there are some hindrances, risks and threats involved in the process of promoting mobile e-work on a wider scale. Mainly, they are concerned with data security or rising costs for companies. The cost of mobile e-work can be a major obstacle to the penetration of mobile e-work in society. However, in many cases the employer has already provided the worker with a laptop, mobile phone and Internet connection. Then practically no extra costs arise from mobile e-work. On the other hand, it must be borne in mind that mobile e-work is often considered as a serious risk for data security. This may create some additional costs, primarily regarding new software.

Transport companies are beginning to realise the potential of more revenues from the increasing number of mobile e-working passengers. This is especially the case if people who normally commute using a personal car, transfer to commuting by train or by bus.

In Finland and in other countries as well, mobile e-work could be promoted as a two-fold instrument for supporting regional and rural communities. Firstly, the metropolitan areas become congested and the quality of air, for example, is deteriorating while the traffic is increasing. Therefore, rural communities seem more and more

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attractive as a living environment, if only they could provide work opportunities. Mobile e-workers could choose to live in rural communities and maintain their work at the metropolitan or other greater urban area. Without the possibility of mobile e-work, such commuting trips would be too burdensome. Secondly, in regional policy, attempts are made to decentralise governmental offices and units from the metropolitan area to regions located farther away. The resistance of employers has so far been adamant in almost all such decentralisation actions that have been accomplished. Mobile e-work would satisfy the needs of those employees who prefer to stay at their housing location in the metropolitan area, and still keep - thanks to a mobile e-work opportunity - their job that moved to a farther away location. It is a challenge for public authorities to harness mobile e-work as an instrument to support decentralisation.

Mobile e-work should be seen as one of the options inside the complete toolbox for e-work solutions. It has turned out that the best performing solutions are often combinations of various e-work patterns or solutions that are adaptable to modifications. Such changes in e-work models should in each case follow up the different life situations of the employee or development stages of the employing organisation. The ICT equipment and infrastructure should not ultimately determine the applications of mobile e-working. The main impetus should always come from the motivation of the mobile e-worker and his or her needs to adopt mobile e-work as a factor of social welfare. Various types of equipment can be experimented with, and eventually a tailor-made solution can be found.

In the future, mobile e-work will more and more become a facilitator of differentiating choices of housing location. Consequently, rural communities will have a better chance to attract mobile e-workers as new residents. Mobile e-work could thus bridge the digital divide between cities, more distant regions and rural communities.

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KEY TERMS

Digital Divide: Digital divide means unequal access and use of data, information and communication. More specifically, digital divide means unequal access to ICT infrastructure or lacking skills in using it.

E-Work: E-work is work carried out outside one's normal workplace, at home, telework centre or satellite office, by using ICT equipment and infrastructure. A previously common term for this concept is telework or telecommuting (used especially in the USA).

Mobile E-Work: Mobile e-work is a concept referring to e-working in a mobile mode. The term mobile e-work can be defined as "e-work being done while commuting" or "e-working while commuting." To be precise, the overall concept of mobile e-work covers e-working on other trips as well, not just while commuting to and from the regular workplace. For example, e-working can be done on a person's way to meet clients, to attend conferences, etc., whenever "on the move" outside the regular office. The most general case of mobile e-work refers to a commuter's e-working. To make matters more complicated, "mobile" e-work also refers to situations that are stationary - such as sitting on a bench in an airport and teleworking with one's laptop. Mobility here means that you have moved away from your office, you are on the

move outside the office, even if not moving in any vehicle at the moment of e-working.

Mobile Work: Mobile work means work that is carried out while moving. The work of bus drivers and pilots, as well as other personnel in various vehicles is mobile work. Mobile work can also be conducted by passengers. Mobile work is the opposite of work carried out as fixed on a given location.

Nomadic Lifestyle: Nomadic lifestyle is a mobile lifestyle where a person has adopted a high degree of mobility in his or her life. The person moves a lot and frequently between various places of housing, work, errands, hobbies, recreation, and socialising.

Modern Tools and Technologies for the Visually Impaired

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INTRODUCTION

Today, people all over the globe are reaping the fruits of modern technology. One can now use a hoard of devices, ranging from desktop PCs (personal computers) to handy palmtops, for accessing information in one's day-to-day life. But, unfortunately the visually impaired have hardly gained anything form such a mammoth information revolution. Over the past few decades their only means of availing information was through embossed Braille books and audio books. Braille books relating to any particular subject are almost impossible to find, and in most cases they do not even exist. On the other hand Audio books were typically stored on magnetic tapes, and this did not facilitate navigation to different portions of the text.

However, the recent developments in the field of assistive and accessible technologies have opened the gateway to the world of information for the visually challenged. They can now access information very easily using various hardware and software tools. These include text-to-Braille translation software, sophisticated Braille embossers, tactile Braille displays, screen readers, and navigable audio books. In the following sections we will get a glimpse of how some of these technologies can enable the visually impaired to benefit from the information age.

THE BRAILLE CODE

In 1829, Louis Braille modified an alphabet code used by the French army and developed what later came to be known as the Braille code. Over the last couple of centuries the Braille code has been accepted throughout the world as the fundamental form of written communication for the visually impaired. The Braille code uses cells or blocks, each having six dots as shown in Figure 1. Some of the dots in each cell are raised, and based on the pattern thus formed, cells can represent the letters, numbers, and symbols of the language to be written. This enables the visually impaired to read by touch. Sometimes a Braille cell consists of eight dots instead of six (e.g., European Braille).

Figure 1. A Braille cell with six dots
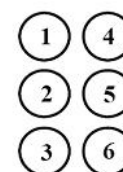
A Braille text can be represented in either of two forms:

- **Grade – I:** This involves the character-by-character translation of some language into its corresponding Braille. Each character being represented by a single Braille cell.
- **Grade – II:** Since Braille books are much larger and bulkier than printed ones numerous contractions or abbreviations have been introduced to make them take up less space and faster to read. This contracted Braille is known as grade – II Braille.

TEXT TO BRAILLE TRANSLATION

Braille was originally written by hand using slate and stylus, later Braille typewriters were introduced (e.g., the Perkins Brailler). Trained Braille transcribers were required for translating printed text into Braille and embossing it. Today, the task has been simplified to a great extent. A number of software applications exist which can translate printable text in various languages to their corresponding Braille representations. Such software can accept text in variety of standard formats like ACSII text files, HTML, Microsoft Word files and produce corresponding Braille output. This may then be fed to electronic Braille embossers to obtain text that can be easily read by the visually impaired.

Examples of such software include Duxbury DBT (Duxbury Systems, 2000) and Sparsha (Basu Anupam). Duxbury DBT supports 18 different languages, including

grade 1 and grade 2 translations of English, Spanish, French, Portuguese, Arabic, Malaysian, and Swedish. Sparsha was developed at the Indian Institute of Technology, Kharagpur, India as a research project. Its primary objective was to provide text to Braille translation for Indian languages. Also the cost of commercial Braille translation software like Duxbury DBT was unaffordable for those in low socio-economic situations in developing nations in the region. Sparsha supports a number of Indian vernaculars including Hindi, Bengali, Marathi, and Oriya, as well as English. Both of these software programs support conversions of elementary images into their tactile representations, as well as translation of mathematic and scientific notations into Braille (Nemeth, 1972; Cramer, 1991).

Other Braille translation software include WinBraille (Index Braille), NFBTRANS (National Federation of the Blind), and Monty (Quantum Technology, 2004).

Some other related software includes:

- **WinDOTS:** provides a tactile representation of the Microsoft Windows on a Braille display.
- **GOODFEEL, Toccata:** translation software for musical notes to Braille.
- **TGD Pro, SparshaChitra:** can convert images into tactile Braille representation and print them out using Braille embossers.

The output of such software is typically fed to a Braille embosser. Braille Embossers are available from manufacturers like Index (Index Braille), Thiel, and Braillo. Alternatively Braille output may be sent to refreshable Braille displays. There are special Braille embossers from manufacturers like Index (Index Braille) and Tiger that extensively supports tactile graphics.

REFRESHABLE BRAILLE DISPLAYS

A refreshable Braille display consists of a line of electronic Braille cells. Each cell is composed of six or eight moveable pins corresponding to the dots in a Braille cell. These pins are electronically controlled to move up or down, thus forming a string of Braille characters. Each pin is moved up or down by a tiny solenoid or piezo-electric crystal. Commercial refreshable Braille displays provide a wide range of other accessibility features. Some of the more common features of such Braille displays will now be discussed in detail.

A refreshable Braille display is usually connected to a PC. Applications like screen readers running on the PC feed the Braille display with text to be displayed in Braille. A Braille PDA (Personal Digital Assistant) or "Note-taker" is another related device. It consists of a refreshable Braille display, memory for storing documents, a keyboard for entering data, rechargeable batteries and enough processing power such that the Braille PDA can be used even when it is not connected to a PC. More advanced Braille PDAs also include speech support (using text-to-speech engines), an internal modem, Ethernet and wireless (802.11-WiFi) connectivity.

Refreshable Braille displays are available in various sizes depending on the number of Braille cells, which usually range from about 20 to 80 cells. Each Braille cell usually consists of eight dots, in order to support both six-dot and eight-dot Braille formats. While displaying Braille in the six-dot format the two extra dots may be used to indicate uppercase characters and the cursor position.

Most refreshable Braille displays also provide various function keys for navigating through any text. As previously mentioned PDAs and "Note-takers" also include a 6-key Braille keyboard or a standard QWERTY keyboard. Some Braille displays and PDAs also include other proprietary navigation interfaces like cursor keys or easy access bar.

Refreshable Braille displays and PDAs usually provide a number of different communication ports for interfacing with other devices including a PC. These ports may include serial and parallel interfaces, USB, Ethernet, modem, and audio input/output.

Other than refreshable Braille displays, refreshable tactile graphic displays are also available (KGS Corporation, 2004). A refreshable tactile graphic display consists of a rectangular array of rounded pins which can be raised to form the desired pattern or image, and hence can display tactile graphic images that can be felt by visually impaired users. This allows them to get a first hand experience of images like maps and geometrical figures.

Thus, we see that refreshable Braille displays can be a viable alternative to the traditionally bulky Braille books. Refreshable Braille displays are available from manufacturers like KGS Corporation (KGS Corporation, 2004), ALVA, and Papenmeier. However, current refreshable Braille displays are prohibitively expensive and this continues to be a major drawback in their use.

SCREEN READERS

Screen reader software attempts to audibly read out loud whatever is being displayed on the computer screen. In today's GUI based environments this includes window titles, menus, toolbars, and application specific information like text in a word processing application. The screen reader is also responsible for providing audio feedback for the actions performed by the user. This includes audio response for each key press, for menus that are activated and dialogue boxes that pop up as a result of user inter-

action. There are many different aspects of a modern screen reader, some of which will now be briefly discussed.

The use of key combinations is essential for working efficiently using a screen reader. Such key combinations trigger appropriate commands for either the screen reader or the operating system or both. Key combinations for reading a text, for spelling a selected text, for reading out the list of open windows, are some of the commands that invoke the screen reader. Certain other key combinations invoke the operating system like those for closing an application. Yet others invoke both the operating system as well as the screen reader, requesting audio feedback related to that particular event. For example, commands for switching between applications.

With the help of modern screen readers, the visually impaired can even browse the Internet. This allows them to access the vast amount of information available on the World Wide Web. Such modern screen readers allow users to navigate through normal text, headings, frames, lists, tables and alternate text for images (if present). These screen readers also help visually impaired users check e-mails and fill out Web-based forms.

Other common features of commercial screen readers include voice support for installation, enlarged fonts for users with low vision, support for refreshable Braille displays, and application specific support for common software like word processors, multimedia players, help applications, mail clients and even IDEs (Integrated Development Environments) for certain programming languages. Another important aspect of screen readers is the number of languages they support. Commercial screen readers can support ten or more different languages. For example, SAFA (a screen reader that can support a large number of Indian vernaculars) has been developed by the National Association for the Blind, Delhi (Kaushal Dinesh, 2004).

A screen reader typically depends on an external Text-to-Speech (TTS) Engine for producing human voice output. The screen reader when prompted by user input feeds text information from particular sections of the screen to the TTS, which in turn reads it aloud, thus providing the user with audio feedback. A screen reader can use a number of different TTS engines, which may again correspond to different languages. For example, Shruti is a TTS for Indian languages. TTS engines also support additional functionality such as pitch and voice rate variations.

Screen readers available for Microsoft Windows include Jaws (Freedom Scientific), HAL (Dolphin Computer Access), SAFA (Screen Access For All), OutSpoken and Window Eyes. Screen readers for Linux platform include Blinux, Gnopernicus and Talking Linux for the Blind (Butorac Danko), and Emacspeak (Raman T.V.). Other software programs that have screen reader like functionality includes the Home Page Reader by IBM.

OTHER RELATED TECHNOLOGIES

- **Alternative User Interfaces:** Apart from tactile and audio feedback based interfaces, various other innovative user interface schemes for the visually impaired have been proposed over the last decade, as a result of the continuing research in the field of Human Computer Interaction. These include tactile mice (Petrie, 1995; Wiker, 1991), haptic virtual reality (Colwell & Chetz, 1998), voice recognition systems (Speech Technology, 2001; IBM Scansoft, 2004). However a large number of these innovations are not yet commercially viable and only exist as prototypes in laboratories.

- **Communication Devices:** Communication devices for the blind primarily include accessible mobile phones and GPS (Global Positioning Systems). Accessible mobile phones may be subdivided into two categories. The first category consists of phones which have been designed specifically for visually impaired users, including the actual hardware. The other category consists of normal high-end mobiles that support screen reading software such as TALKS [7]. Another useful communication tool for deaf/blind users is the Braille phone (Burton Darren).

- **Optical Character Recognition (OCR):** Rapid developments made in the field of optical character recognition has allowed printed material to be scanned into a computer and then read out using a standard TTS. Such systems are commercially available from manufactures such as Kurzweil Technologies.

CONCLUSION

This article provides a brief overview of how modern assistive technologies can help the visually impaired benefit from the information revolution. Using such technology, the visually impaired can even access the vast amounts of information freely available on the Internet. This allows them to more easily find information covering their areas of interest. However, a lot more still needs to be done before the benefit of such technology reaches those in the low socio-economic domains. Developers in this field have to face two major challenges. Firstly, these technologies must provide more support for regional languages which are easily understood by the people who are socially and economically diasadvantaged. Secondly, the costs associated with these technologies are still prohibitively high, especially for people in developing countries. Hence more cost-effective solutions need to be developed.

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KEY TERMS

Accessibilty Toolkit: These refer to software tools and resources, provided by operating system manufacturers, that help in the developing accessibility software (e.g., screen readers).

Braille Embosser: A Braille embosser is analogous to a regular computer printer. It outputs Braille text on special Braille paper. The Braille embosser produces dots on the thick Braille paper by mechanically striking it with a set of styluses. These dots follow the Braille code and can be read by touch.

DAISY: Digital Accessible Information Systems (DAISY) is a standard for digital talking books maintained by the DAISY Consortium. It was developed with the objective of making talking books more accessible and to facilitate navigation within the book. It allows the storage and retrieval of information in a multi-modal format in order to reach out to people with different disabilities.

Piezo-Electric Crystal: A crystal having the property such that when it is subjected to mechanical strain (e.g., pressure) it develops electrical charge of opposite polarity on opposite faces. Conversely when electrical potential of opposite polarity is applied on opposite faces, mechanical strain is induced in the crystal.

Solenoid: A solenoid is a coiled length of wire such that when an electric current is passed through it a magnetic field is developed along the axis of the coil. This magnetic field may in turn be used to attract or repel other magnets or ferro-magnetic materials.

Sound Card: A sound card is a device that can be attached to a computer in order to obtain audible sound (e.g., voice or music) other than the beeps emitted from the PC speaker. The sound card may in turn be connected to external amplifiers and speakers.

TTS: A TTS (Text-to-Speech) synthesizer is a software application that takes text input and produces its corresponding voice rendition.

ENDNOTE

[1]   The product names specified in this article serve only as examples and are not an exhaustive list. All product names are trademarks or registered trademarks of their respective owners.

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National Competition Policy and Broadband Provision in Australia

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INTRODUCTION

National Competition Policy (NCP) implemented in Australia from 1995 has had a profound effect on the mode and level of service delivery in nonmetropolitan regional and rural areas. The implementation of NCP followed the lead of other countries in corporatising, segmenting, and privatising many state and national government services and utilities and promoting open global competition as the framework for service delivery in the future. As government moves out of the role of service provision and into the role of industry regulation, there has been significant jurisdiction shifting in terms of responsibility for services, as well as reduced subsidisation for the cost of service over distance: subsidisation that was previously enabled through government-owned nationwide monopolies. This is more of an issue in Australia than in many other countries due to the large landmass and relatively small but dispersed population. Unlike many other countries, however, Australia has been slow to increase the proportion of overall tax revenue given to local government bodies to ensure regional service delivery or to impose community service obligations (CSOs) at local levels. Confused local bodies have been left to build expensive business plans to attract new services in areas for which they currently have little or no funding, and in which they previously had no responsibility or expertise. Local bodies are currently being requested to aggregate demand across government, private, and residential customer bases. Management of the delivery of broadband services is an example of the confusion faced by regional bodies in Australia in the wake of a recently corporatised government utility and a liberalised telecommunications environment.

BACKGROUND OF COMPETITION POLICY IN AUSTRALIA

Like many parts of the world, Australia has embraced a programme of neoliberal reforms to liberalise services previously provided to the Australian population by government-owned and sometimes subsidised monopolies. The most significant development toward the liberalisation of the provision of government services in regional areas was the introduction of the National Competition Policy (NCP) in 1995.

The greatest concerns about the implementation for the NCP related to the effect on people living in nonmetropolitan areas where the "thinness" of markets meant that competition between suppliers was often difficult to establish. There were also concerns that market segmentation and the introduction of cost reflexivity leading to lower levels of cross-subsidisation—as often provided by government suppliers in the public or national interest—would naturally lead to higher prices in low-population-density areas.

In 1999, the Productivity Commission undertook an inquiry into the *Impact of Competition Policy Reforms on Regional and Rural Australia* and found the following:

There would appear to be significant gains for the Australian community, and for country Australia as a whole, from implementing NCP reforms. The reforms are likely to have a more varied effect in country regions than in metropolitan areas, with implementation costs of some reforms being more evident in the former. (Productivity Commission, 1999, p. 306)

In light of the fact that some areas were suffering more than others due to the implementation of the NCP, the Productivity Commission in its inquiry reviewed the measures that could potentially be utilised by the Commonwealth of Australia to mitigate the impacts of the NCP. These measures include the following:

- Action by the Australian Consumer and Competition Commission (ACCC) to limit anticompetitive behaviour
- Community Service Obligations (CSOs) to ensure that governments do not abrogate their responsibilities to provide an "adequate" level of service
- Policies designed to allow ubiquitous access to infrastructure and important services—the examples given are the Regional Telecommunications Infrastructure Fund and rural transaction centres
- Regional development policies designed to increase the level of activity in particular communities

- Horizontal Fiscal Equalisation (HFE)—intergovernmental transfers that provide states and regions with the fiscal capacity to provide an "average" standard of service to all citizens across Australia

These measures were also reviewed in the report, and all appeared to have their shortcomings:

- Legal intervention to prevent anticompetitive behaviour by the ACCC could often be evaded by the broad definition of "market" under the Trade Practices Act. Therefore, regional areas suffering from geographic monopolies often have no legal recourse for locally defined instances of market abuse.
- Cross-subsidies needed to implement CSOs were often no longer available due to the segmentation of government-owned monopolies and the introduction of free-market competition. Therefore, CSOs imposed upon government bodies were often unresourced, were suffering from diminishing resources or higher costs, and often reflected the political decisions of metropolitan constituencies.
- Access to infrastructure was in some areas effective but was seen by many as part of the ongoing problem.
- Regional development policies had failed in the past and often only succeeded in shifting business activity from one part of Australia to another.
- Horizontal Fiscal Equalisation (HFE) had been gradually eroded and had not kept pace with the real cost of service provision in the light of the privatisation of state and national services. Diversification of many industries also provided difficulties in determining an "average" standard of service (Productivity Commission, 1999).

LIBERALISATION OF AUSTRALIAN TELECOMMUNICATIONS

Congruent with implementation of the National Competition Policy, telecommunications began to be liberalised in the early 1990s in Australia, and gained momentum in 1997 with the introduction of open competition and the partial sale of the government-owned incumbent telecommunications provider, Telstra. A universal service obligation (USO) was introduced with competition to ensure that every Australian citizen had the right to a well-maintained telephone service in the newly competitive environment. However, it was Telstra who remained the primary Universal Service Provider (responsible for providing a public telephone service). As the importance of data delivery

was recognised, the Digital Data Service Obligation (DDSO) was introduced to mandate that all Australians had access to 64 kbps data speeds—although this was a licence condition specifically inserted into the operating licence of Telstra (still majority government owned) and did not include price controls.

The introduction of new services in the form of increased bandwidth, or broadband, however, has been problematic. Not included in any national service obligation, the delivery of broadband services has been left up to market forces. As a result (and as would be expected), investment and infrastructure have been concentrated in population-dense metropolitan areas where yields are highest. Recently, competition has also followed ADSL-enabled telephone exchanges on Telstra's infrastructure. Telstra has by-and-largely maintained the monopoly on the main telecommunications infrastructure into the home—the copper telephone wire. This, in turn, has led to significant geographic-based price and access disparities, and to an urban-rural, socioeconomic spatial polarisation, as the ICT investment enables further economic development, and the development of locational hegemonic social actors in the form of well-wired management hubs, a pattern of development that is not unique to Australia (Cornford & Gillespie, 2001; Graham, 1999).

A parliamentary inquiry into infrastructure development in regional areas in Australia in 2000 stated:

Throughout the inquiry, the most widely held view was that, of all sectors, telecommunications infrastructure is the most critical in terms of the future development of regional areas on two grounds—(i) economic viability and development, and (ii) social cohesion. (House of Representatives Standing Committee on Primary Industries and Regional Services, 2000, p. 115)

Most broadband services in nonmetropolitan areas in Australia are delivered via ADSL services at roughly comparable prices to ADSL services in metropolitan areas. The main problem for regional areas is reaching people and businesses that are out of range of ADSL services (more than 4.5 km from an enabled telephone exchange). For these people, the only broadband option appears to be satellite services, which are approximately four times the cost of ADSL. The estimates of people reliant on satellite technology vary from between 20–30% of the Australian population, but information available to the public regarding broadband availability and connections is scarce. Regional areas with highly dispersed populations (such as East Gippsland in Victoria or the Northern Rivers of Northern NSW) are currently likely to have much higher proportions of the population reliant on satellite services.

In the wake of the newly liberalised telecommunications environment in Australia, responsibility for the provision of new telecommunications services, such as broadband, is unclear. This is a concern due to the increase in the number of government and business services now solely delivered via Internet-based systems. The imperative to upgrade to broadband services is also a function of a heterogeneous Web-speed environment. More broadband content circulating the Internet is causing network externalities in the form of narrowband line congestion, or "net drag" (Cameron, 2003). Net drag will mean that narrowband connections may become increasingly dysfunctional due to other users sending and receiving material designed for broadband use.

The implementation of the NCP has shifted emphasis and responsibility of telecommunications service from government bodies to the consumer/citizen. In nonmetropolitan areas, these consumer-citizens have been encouraged to build business cases for service delivery. Preparing these business cases alone can often be a timely and expensive process, and not one required in many metropolitan areas.

"Demand aggregation" seems to be the current key term for the development or delivery of new infrastructure of all descriptions. Nonmetropolitan areas that fail to commence negotiating with broadband suppliers may fall behind. Responsibility for demand aggregation and attraction of affordable broadband supply appears to have fallen on local and regional organisations. As Neil Bulless, Manager of the Information Management Section of the Department of Communications, Information Technology and the Arts (DCITA) stated:

The role of communities, government bodies and development organisations in aggregating demand to maximise the opportunities afforded by the commercial rollout of bandwidth cannot be understated. (Bulless, 2001, p. 15)

THE ROLE OF REGIONAL GOVERNMENT IN BROADBAND SUPPLY

Regional bodies have been slow to recognise and respond to broadband need in their communities due to debate over the level of demand and value of broadband services and confusion as to which organisations should assume responsibility for demand aggregation. Regional bodies requiring broadband services include a mix of local, state, and federal government services, business development and community organisations, and the private sector—all with different network needs, aims, and governance structures.

The recent report from the Broadband Advisory Group (2003) *Australia's Broadband Connectivity* suggests that specialised "demand brokers" facilitate the procurement of reasonably priced broadband services by negotiating with suppliers, and that the initial establishment of regional brokerage services might be a Commonwealth or State/Territory initiative. A Commonwealth programme is now in development, and demand brokers are expected to commence work in late 2004.

There are concerns with the concept of "demand brokers," however:

1. Demand can be aggregated in many ways—not always with geographical provision in mind.
2. Demand brokers do not accept any responsibility for the provision of broadband services to all citizens at comparable prices and are not elected representatives.
3. It is unclear how demand brokers and particular telecommunications companies (who are also undertaking their own demand registers) will articulate.

SHIFTING RESPONSIBILITY, SHIFTING FISCAL CAPACITY

Decentralising responsibility for service provision without decentralising fiscal capacity is clearly shifting the cost of service provision onto regional bodies and the individual constituent. Fiscal and administrative transfers to the local level have occurred in most other OECD countries in response to global pressures and neoliberal government reforms:

During the past two decades forces favourable to the decentralisation of government functions have prevailed over centralising forces. Major transfers of powers to lower governmental levels have taken place almost everywhere (in the United Kingdom, Spain or Poland to give the most recent examples), but the rate of movement has varied from country to country. In the most striking cases, new levels of administration have been created. At the local level everywhere, public expenditure is still higher than the amount raised by taxes and fees. Central government thus continues to subsidise local administrations. (Hugonnier, 1999, p. 5)

Subsidies to local government in Australia occur through the Horizontal Fiscal Equalisation (HFE) process. As reviewed by the Productivity Commission, however, HFE has not kept pace with the costs and demands of service delivery in regional areas in light of

the impacts of NCP. This has meant that Australia has not followed European trends to divest capability to respond to global pressures on lower levels of government. The increasing responsibilities of, and cost shifting to, local government was reviewed in October 2003 by the House of Representatives Standing Committee on Economics, Finance and Public Administration. Although telecommunications were noticeably absent from the review, the report stated:

...the overriding message is very clear. To fix cost shifting on the part of all levels of government, we need to review our governance arrangements and the way our taxes, including rates, are spent. Cost shifting can be seen as a symptom of the current weaknesses in our system and it is the responsibility of all spheres of government to address the matter.

...The extent and effects of cost shifting are detailed as the major problems facing local government's deteriorating infrastructure. (Hawker, 2003, p. 7)

The absence of broadband from this recent and comprehensive review highlights the increasing ambiguity of responsibility for new services. Although telecommunications has traditionally been a Commonwealth responsibility, the diversity of delivery options now available and the range local telecommunications needs appear to make it more suitable for local decision-making bodies.

It is posited here that responsibility for demand aggregation and broadband provision could sit at a local government level and be funded through the HFE process. Local government bodies could potentially undertake a community service obligation to supply national benchmarks of bandwidth to their constituency if they were reimbursed for their services through the HFE intergovernmental grants from federal tax revenue. Local government could decide upon broadband options, including investing in their own infrastructure and expertise (in particular, wireless networks), attracting and brokering supply from external or community providers, or subsidising satellite connections.

FUTURE TRENDS

Several reports in the past five years have agreed that remedial action is needed to prevent further socioeconomic polarisation of metropolitan and nonmetropolitan areas due to uneven bandwidth supply (Besley, 2000; Broadband Advisory Group, 2003; Estens, 2002). The various bandwidth advisory committees convened to examine the issue have suggested several schemes: deploying broadband brokers to regional areas, and a Higher

Bandwidth Subsidiary Scheme (HiBIS) to offer subsidised access to benchmark data speeds, and better informational services regarding broadband adoption. None of the measures, however, clears up the blurry jurisdictional boundaries of responsibility for bandwidth supply, or gives citizens in nonmetropolitan areas any further rights to broadband service delivery within an open-competition framework. This has proven problematic with the proposals to completely privatise the incumbent partially government-owned telco Telstra, and encourage further competition in regional areas. Happily, competition in the satellite market may soon alleviate some of the issues regarding bandwidth supply across much of the country. In late 2002, a series of announcements were made regarding the launch of high-capacity "3G" satellites that were to:

deliver a range of services across the continent, especially to Australians living in rural and remote area. ... The range of services that NSS-6 will be capable of delivering across Australia include traditional broadcasting services, two-way broadband access, advanced IP services, live Internet broadcasting, video-on-demand, digital television, HDTV and interactive television. (Department of Communications Information Technology and the Arts, 2002)

The advent of competition in the satellite market has also been highlighted by other authors as potentially diminishing the differences between the ICT access of "global cities" and the regions in other countries:

...Advances in broadband satellite services, such as the five or six global broadband satellite systems now planned or under development, may also serve to blunt the distinctive telecommunications advantages of favoured global cities. (Graham, 1999, p. 941)

There are also very optimistic reports regarding the deployment of 3G wireless technologies via Telstra's CDMA infrastructure. Technological advances that offer nationwide bandwidth may alleviate the issue of responsibility for telecommunications service levels in the short term, however, advances in this field are extremely fast and are likely to be dependent on the development of new Internet-based content and applications. Advances in this area are also likely to mean that responsibility for service delivery will be an ongoing issue.

CONCLUSION

It is argued in this article that there is a clear need for the boundaries for responsibility for broadband services to be delineated within the different levels of government

in Australia, and for local organisations to be adequately resourced from central revenue for the work they undertake in broadband delivery. The current confusion and ambiguity regarding the governmental responsibilities for service delivery has, up to this point, meant that nonmetropolitan areas and citizens have incurred unforeseen costs in attracting broadband suppliers, or in erecting their own broadband infrastructure. Although technological advancements (in particular, high-capacity satellites) have the potential to ameliorate some of the regional disparities in broadband access in Australia, ongoing technological developments will mean that responsibility for bandwidth delivery will be an ongoing issue.

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KEY TERMS

Community Service Obligation: Obligations undertaken by particular levels of government to ensure the provision of certain services. In Australia, these obligations are seen by courts of law as "parliamentary duties" rather than legally enforceable contracts.

Competitive Neutrality: A principle that states that government agencies and businesses should not enjoy any competitive advantage over privately operated competitors in the delivery of services by virtue of being government owned. Competitive neutrality is achieved

through transparent accounting and cost-reflexive charges for services.

Horizontal Fiscal Equalisation: A series of intergovernmental grants that ensures that all Australians have access to "an average" level of services. First implemented in Australia in 1934, Horizontal Fiscal Equalisation was seen to be a basic tenet of Australian Federalism. Horizontal Fiscal Equalisation was designed to prevent independent economies developing in the different communities in different geographic locations in Australia, and to ensure that citizens were not significantly disadvantaged in the delivery of government services due to their geographic location.

National Competition Policy: A policy introduced by the Australian Commonwealth Government in 1995 with the aim of promoting competitive service provision in Australia. It did this through restructuring of public utility monopolies, allowing for private businesses to gain access to certain state-owned infrastructure facilities, and the implementation the principle of "competitive neutrality" between government businesses and private-sector competitors.

Neoliberalism: The promotion of free enterprise in competitive global markets, including the free movement of goods and services with little burden from taxes and tariffs. Government plays a regulatory role, rather than a role of service provider. Small government and low tax environments are seen as attractive to global capital investment.

N

The Need for Community Informatics in Malaysia

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THE NEED FOR COMMUNITY INFORMATICS

The Malaysian government, through many initiatives, has seriously looked into reducing and if possible eliminating, the digital divide that exists between the developed urban and the technologically impoverished rural communities. The e-Bario Project, a successful research showcase of Universiti Malaysia Sarawak, is one of the leading examples in Malaysia of such an attempt to bridge the digital gap and to achieve sustainable human development through the introduction of information and communication technologies (ICT). According to Harris, Bala, Songan, Khoo and Trang (2001), the World Bank had introduced a systematic approach to the application of ICT to meet the needs and bridge the digital divide of the rural community. The following are the steps to be taken in this systematic approach:

- *Identify the needs and priorities of the rural communities for areas such as agriculture, education, commerce, natural resource management, health, etc.*
- *Determine the types of information needed to help meet those needs, including information gathered from the rural population and transmitted to policymakers and project designers, and information shared among rural communities.*
- *Determine the gaps between the information currently available and what is needed.*

- *Determine how ICT can close those gaps and build valuable synergies by mobilising information across sectors.*
  (Harris et al., 2001, p. 274)

Harris et al. (2001) further claimed that telecentres were being hailed in many countries in Africa, Latin America and Asia as the new solution to development problems to provide ICT access and bridge the digital gap. Gomez, Hunt and Lamourex (1999) defined telecentres as public-access facilities to provide electronic communications services, especially in marginalised or remote areas where commercial development of ICT is not prevalent.

A baseline study which aimed to determine the possibility of setting up a telecentre in Long Bedian was carried out, as part of the e-Bedian project. The e-Bedian project, modelled after the e-Bario project, was expected to become another successful, self-sustained rural ICT development project through the set-up of a telecentre. The baseline study was conducted in tandem with the recommendation provided by Harris et al. (2001), that is, as a systematic approach in introducing ICT to the rural communities to close the digital gap. The communication pattern and the socio-economic variables obtained from the study helped in planning the development of a telecentre in Long Bedian. The telecentre was expected to play the role of the central communication facility and ICT awareness centre for the village. Gomez et al. (1999) have suggested that a telecentre should provide a combined or integrated ICT based service, for instance, from a basic pay

Table 1. Demographic characteristic of respondents (n=186)

Variable	Category	Number	Percentage
Race	Iban	5	2.7
	Kayan	158	84.9
	Kelabit	12	6.5
	Kenyah	3	1.6
	Morek	2	1.1
	Punan	2	1.1
	Others	4	2.0
Religion	Christian	186	100
Gender	Male	110	59.1
	Female	76	40.9
Age	30 and below	58	31.2
	31 to 40	50	26.9
	41 to 50	40	21.5
	51 to 60	25	13.4
	61 and above	13	7.0
Mean age	*39.6 years*		
Education	Never went to school	52	28.0
	Primary School	47	25.3
	Lower Secondary School	39	21.0
		43	23.1
	Upper Secondary School	5	2.7
	University		
Occupation	Farmer	44	23.7
	Government employee	8	4.3
	Private sector employee	8	4.3
	Business person	20	10.8
	Labourers/General Workers	1	0.5
		14	7.5
	Drivers	51	27.4
	Housewife	5	2.7
	Mechanic	1	0.5
	Tailor	13	7.0
	Timber logging	7	3.8
	Unemployed/retired	4	2.2
	Self employed	2	1.1
	Cook/Chef	5	2.7
	Student	1	0.5
	Contractor	2	1.0
	Others		
Monthly Household Income	RM250 and below	55	29.6
	RM251 to RM500	45	24.2
	RM501 to RM750	20	10.8
	RM751 to RM1000	29	15.6
	RM1, 001 and above	37	19.9
Mean Income	*RM830.20*		
Computer Usage	None	147	79.0
	Less than 1 year	16	8.6
	1-3 years	17	9.1
	4-6 years	5	2.7
	More than 6 years	1	0.5

phone connection to e-mails and Internet connection and services.

BASELINE STUDY OF THE LONG BEDIAN COMMUNITY

Long Bedian is located in the Apoh Tutoh region of the Baram district, in the Miri Division of Sarawak. The village comprised 180 houses and has a total population of 1,686 people. There are only two ways to get to Long Bedian from Miri town. The first way is to take an express boat from Kuala Baram, Miri to Marudi, and then transfer to another express boat to Long Lama. The total express boat journey takes about seven hours. Then from Long Lama, another hour's drive is required by 4-wheel drive (4WD) to Long Bedian. The second alternative is to take

a 4.5-hour drive from Miri, which was just introduced recently. The journey takes about 3.5 hours through the timber logging route, nicknamed "the bone-shaker route," using a 4WD vehicle. The village functions as a trading centre for the nearby villages, particularly for the Penan community. It also provides education and health services to the Long Bedian and Penan community.

Information and communication technology is hardly available in this village. Quite a number of families own radios while very few could afford television sets. While radio reception is quite good for two channels (i.e., the Malay and Kayan service), it is not possible to receive other channels that are commonly available in the urban areas. Television channel reception is also quite poor, with only one out of nine nationwide channels available and sufficiently viewable in Long Bedian. The projected image is often quite fuzzy. The TV antennas have to be set up on tall bamboo poles. A few of the richer families could afford to purchase satellite dish from neighbouring Indonesia, and obtain worldwide channels.

For the purpose of the baseline study, 186 respondents were selected randomly from a population of all the households in the village. This was to ensure that the study will have representation across the whole Long Bedian community. As shown in Table 1, the respondents are made up of various ethnic groups with the Kayan group making up 84.9% of the respondents and the Kelabit as the second biggest ethnic group (6.5%). The other ethnic groups such as Kenyah, Morek, Punan, and other minorities contribute to less than 6% of the respondents. This ratio is in tandem to the community population as a whole.

More than half of the respondents were between the ages of 31 to 50, while 31.2% were below 30 years of age. The remaining respondents were more than 51 years of age. The mean age of the respondents was 39.6 years, signifying that the respondents and community were mainly middle-aged people. Approximately 25% finished their primary education, while 21% and 23.1% of the respondents completed their lower and higher secondary education respectively. However, only 2.7% completed their tertiary education while about 28% of the respondents had no schooling. The respondents in this last category would most likely be those who are 40 years and older.

The respondents were mainly farmers and housewives with a representation of 23.7% and 27.4%, respectively. Business persons, drivers and timber logging workers, together comprised approximately 7% of the respondents. The mean income of the respondents was RM830.20 per month. Nevertheless, more than 43% of the respondents earned less than RM500.00 per month, with 29.6% of them earning less than RM250.00 of monthly income.

Figure 1. Distribution of respondents by the sources and amount of information they currently received from the sources
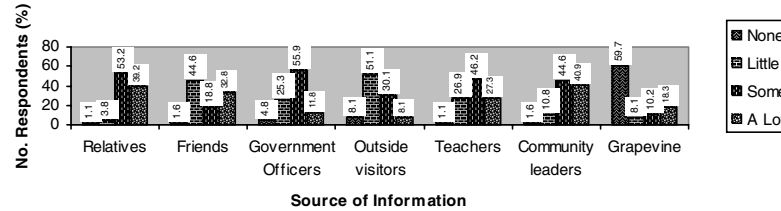
Nearly 80% of the respondents have never used computers before. About 17.7% of the respondents have used computers for more than three years, while only 0.5% had used it for more than six years. The higher educated community members, the teachers and other government officers stationed in Long Bedian would have used computers before, while the community itself generally lacked in its usage.

INFORMATION SOURCES AND CHANNELS

Basically, it can be said that the Long Bedian community is an underprivileged community, as far as information is concerned. The residents do not get to enjoy the benefits of modern ICT to share and disseminate information. Their current main mode of dissemination is still through face-to-face communication and through communal and church meetings and functions.

As shown in Figure 1, according to 92.4% of the respondents, the main sources of information for the Long Bedian community were mainly well-informed relatives whom they might have encountered during their journeys to Miri, Marudi, Kuching or to other nearby

communities. This was followed by community leaders (85.5%), such as the village headman, the local political representative, and the pastors whom contributed significantly with government, development, social, spiritual and religious information. Teachers (73.5%) and government officers (67.7%), who were attached to the village, including visiting officers, were the other major sources of information. This is understandable as the teachers and other government officers often travelled in and out of Long Bedian to other towns and cities to attend courses and meetings. It is during these trips that they were able to equip themselves with the information and furnish the community upon their return.

Surprisingly, the grapevine, which could be considered as one way of disseminating information, was considered the least effective source of information. The remoteness and distance of the village from mainstream development could be a contributing factor for its ineffectiveness.

As shown in Figure 2, a majority of the respondents had identified community meetings (83.8%), face-to-face (82.8%), and church congregation (73.6%) as the main channels of information dissemination. This in tandem with the choice of sources of information discussed earlier where relatives, community leaders,

Figure 2. Distribution of respondents by the channels and amount of information they currently received from the sources
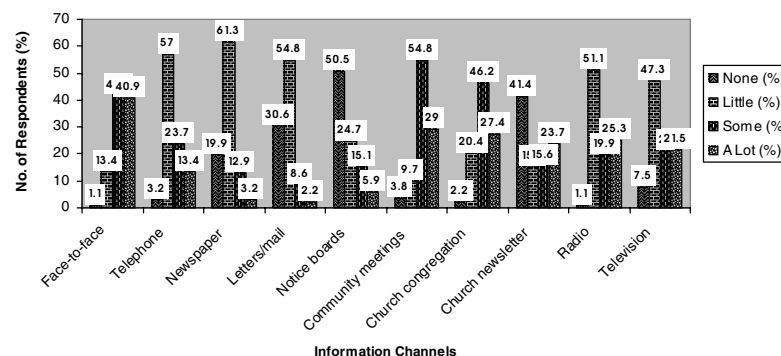
Figure 3. Distribution of respondents by information gap for types and amount of information they needed (n = 186)
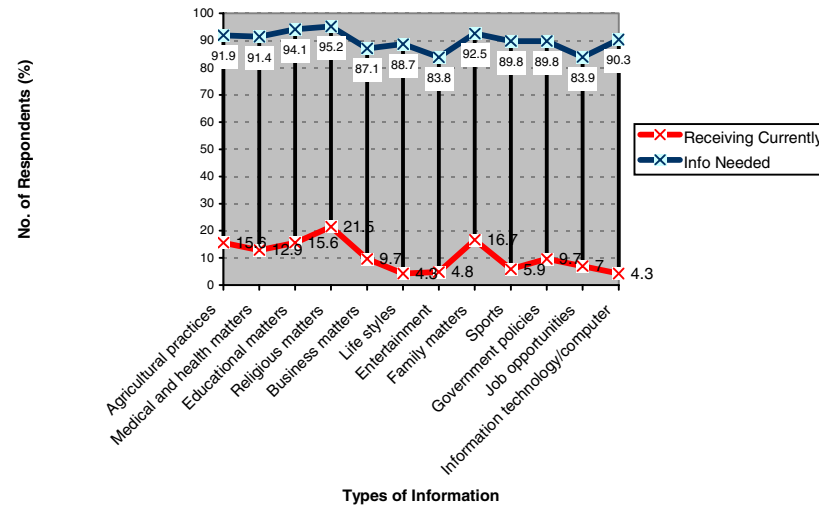
teacher and government officers were considered as the main sources of information.

The survey revealed that most of the information obtained by the respondents was from Long Bedian itself, or from villages or small townships, such as, Long Lama in the Apoh Kayan region of the Baram district. This information was received mainly through face-to-face communication (89.8%), community meetings (84.5%), church congregation (70.9%), church newsletter (37.1%), the radio (39.2%), and some personally owned mobile phones such as ATUR900 (34.4%). It was also noted that most of the information sent to faraway towns such as Marudi, Miri or other divisions, states or countries, was mainly through face-to-face mode, especially during the times when one of the sources of information visited the recipient in Long Bedian.

PERCEIVED INFORMATION GAP AND NEED

Figure 3 indicates the amount of information that has been received against the amount of information that was perceived as still needed. The gap between the two lines in Figure 3 indicates the difference in the amount of information that the community desires to obtain. Overall, there is an indication that the community perceives that it would like to receive more information on all the categories that have been identified. The least received information category of information technology has indicated a huge difference of 86%. Life styles, entertainment, sports and jobs opportunities too have

noted a large difference of more than 80%. This shows that though the community was separated from the modern world by distance and time, they were very keen in keeping up-to-date with information and issues happening in the modern world, particularly in technology and life styles.

It is also interesting to note that though the community had been receiving quite a lot of information on religious matters, they were still very interested in getting more information regarding their religion. It seems they did not want all the modernisation to "rob" them of their love for their religion.

RECOMMENDATIONS

The data collected from the survey, dialogues and group discussions revealed the urgent need for steps to help overcome the information and communication barrier of the Long Bedian community. The recommendations do not differ much from the recommendations carried out in the e-Bario Project, which are:

1. It is proposed that a centre that facilitates communication with the outside world, as well as facilitates the seeking of information and knowledge, be set-up. The community sees the need for continuous communication with the outside world, which is nearly non-existent through any other media, besides face-to-face communication. The community also sees the importance of information and knowledge with respect to better their livelihood, standards of living and education.

2. Due to the current communication facility limitation, Long Bedian is literally unknown to the outside world. The community wants to break this barrier, and introduce Long Bedian as a centre for eco, cultural and ethnic tourism, as well as promote their products. It is hoped that the centre will be able to facilitate and promote Long Bedian in all these aspects.

3. In order to keep up with modernity and technology development, it is proposed that computer and network facilities be established to accomplish the tasks identified in recommendation 1 above.

4. It is also suggested that a pay-phone service be provided at the centre, so that the community could contact anyone outside of Long Bedian or vice-versa. The provision of a pay-phone service would enable the telecentre to generate some income to sustain itself.

CONCLUSION

The Long Bedian community is very isolated from all means of modern communication, and information is mainly disseminated through face-to-face communication in communal gatherings and meetings, church activities and functions, through briefings by the community leaders, government servants and teachers, and perhaps by visiting friends, acquaintances and relatives. Very seldom the community obtains or sends information beyond the nearby Apoh Kayan region villages. The community also lacks information related to their livelihood, education and life styles. It is hoped that with the introduction of a telecentre that houses, facilitates and supports the computer system and networking, and the provision of pay-phone services, the community will be able to communicate extensively and almost immediately, seek information and knowledge globally, as well as promote the village with its tourist attractions.

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KEY TERMS

Community Informatics: The process of using ICT, and ICT-related facilities, such as a telecentre, in social development programmes to help the community develop economically, socially and culturally.

Digital Divide: The ICT (telephone, computer and Internet access) and related services, ownership and access gap that exists between those in the urban areas and those in the rural areas.

e-Bario Project: A research initiative undertaken by Universiti Malaysia Sarawak (UNIMAS) to demonstrate the many ways in which ICT can be used to help marginalised and remote communities in Malaysia to develop socially, culturally and economically.

e-Bedian Project: A research initiative by UNIMAS modelled after the e-Bario research project.

ICT: Acronym for Information and Communication Technology. Includes computer software and hardware, as well as communication technologies such as telephones, and the Internet.

Information Channel: Refers to how members of the community receive information from various sources such as face-to-face, newspaper, telephone, mail/letters, no-

tice boards, community meetings, church congregation, church newsletter, radio and television.

Information Gap: A gap that exists between the amount and types of information received and needed by members of the community.

Information Source: The source from where information is obtained by members of the community, such as relatives, friends, government officers, teachers, community leaders, outside visitors and the grapevine.

Perceived Information Need: The type and amount of information perceived to be needed by members of the community, such as information about information tech-

nology/computers, job opportunities, government policies, sports, agricultural practices, medical and health matters, family matters, entertainment, life styles, business matters, religious matters and educational matters.

Telecentre: A public-access facility providing electronic communication services, especially in marginalised or remote areas where ICT are not prevalent. Computers and networking facilities are normally available in the telecentre.

N

NetTel@Africa

Matthew Mitchell
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INTRODUCTION

NetTel@Africa (NetTel) is a transnational capacity development program focused on improving the policy and regulatory environment for the information communication technologies (ICT) and telecommunications (telecom) sectors. Originally, NetTel was developed as a programmatic response by USAID's Leland Initiative to a request for human resource development by the Telecommunications Regulators Association of Southern Africa. NetTel is aligned with the USAID. During the development of the program, it became evident that an expansion of NetTel beyond the Southern African Development Community (SADC) region would greatly improve the quality of capacity development in formulating policies and regulation. Recently, NetTel has expanded to priority Western and Eastern African nations.

The overall goal of NetTel is to expand access to ICT and telecom services for all citizens in Africa. To achieve this broad goal, NetTel seeks to leverage advanced level policy making and regulatory controls to stimulate private sector investment in services and infrastructure and to promote the adaptation and application of ICT and telecom services by governments, businesses, schools, and communities. This section provides an overview of the NetTel program, focusing on the structure, principles, practices, and lesson learned from this on-going initiative.

STRUCTURE

Formally established in 2002, NetTel is comprised of four interconnected components. The first component is an international peer network that links together ICT and telecom regulators from African countries with peers in the United States and Europe. The peer network has also expanded to connect researchers and instructors with specialization in ICT, telecoms, and public policy. Active participation in NetTel's peer network includes, among others:

- Association of Information and Communication Regulators in East Africa
- Botswana Telecommunications Authority
- Communications Authority of Zambia
- Communications Commission of Kenya
- Independent Communications Authority of South Africa
- Lesotho Communications Authority
- Nigerian Communications Commission
- Tanzania Communications Regulatory Authority
- Telecommunications Regulators Association of Southern Africa
- Uganda Communications Commission
- U.S. National Association of Regulatory Utilities Commissioners
- West African Telecommunications Regulators Association

Similar to the peer network, the second component is an international network established to connect community level ICT development projects. Outcomes of the community network include the sharing of knowledge and experience as well as the adoption of project designs in other communities. Currently four projects have been developed. The first is a skills development seminar series that focuses on the best practices in using ICT in the classrooms of secondary education. The second is a youth-based collaboration directed at building computers for community technology centers. The third is the creation of a professional e-learning diploma program in transportation operations management. The fourth is a network of South African universities studying the opportunities and challenges of implementing ICT-enhanced teaching methods in fields such as science, agriculture, management, and public policy. Current partners involved in designing and implementing these ICT-based community projects include:

- Malawi College of Accountancy
- National University of Rwanda
- University of Durban (South Africa)
- University of Malawi – The Polytechnic
- University of the North (South Africa)
- University of Pretoria (South Africa)
- University of Witwatersrand (South Africa)
- University of Zululand (South Africa)
- Washington State University (U.S.)

NetTel's third component is a research program that seeks to strengthen the quantity and quality of data relevant to ICT and telecom policy and regulation in

Africa. Outputs of NetTel's research program are widely distributed among interested parties and are included in the curricula of NetTel's training program in ICT/telecom policy and regulation, which is NetTel's fourth component. While this is the least developed NetTel component, examples of research output include the recently published book titled *Africa Dot Edu: IT Opportunities and Higher Education in Africa* (2003, Tata McGraw-Hill), as well as the 1st Annual NetTel@Africa Scholars Symposium held at the University of South Africa (conference proceedings forthcoming). The book, *Africa Dot Edu*, is an edited compilation of case studies documenting how ICTs are currently being applied in African institutions of higher educations and serves as a baseline for future research initiatives. The Scholars Symposium is part of NetTel's training program (the fourth component) and features presentations of recently completed research projects by NetTel's students and faculty as well as the delivery of papers by industry experts on cutting edge issues.

The training program is offered through three options: executive seminar series, a post-graduate diploma program, and a Masters degree program. All three options are offered through a networked alliance among a growing number of African universities and training institutions. Students enrolled in one of NetTel's training programs are experienced professionals from ICT-related fields such as policy making, regulation, service provider, and industries involved in telecommunications. And, for each option, the curriculum is problem-based; the learning communities are designed to international in scope (with a focus on the African regions), and the medium for teaching and learning blends face-to-face interaction with ICT-based instruction. The universities and training institutions actively involved with NetTel's training programs include:

- African Advanced Level Telecommunications Institute (Kenya)
- Jomo Kenyatta University of Agriculture and Technology (Kenya)
- Makerere University (Uganda)
- National University of Rwanda
- Nairobi University
- Obafemi Awoloyo University (OAU) at Ile-Ife (Nigeria)
- University of Botswana
- University of Colorado (U.S.)
- University of Dar es Salaam (Tanzania)
- University of Florida (U.S.)
- University of Fort Hare (South Africa)
- University of Jos (Nigeria)
- University of Lagos (Nigeria)
- University of Maryland (U.S.)

- University of Nairobi
- University of Nigeria at Nsuka
- University of South Africa
- University of Western Cape (South Africa)
- University of Witwatersrand (South Africa)
- Washington State University (U.S.)

The formation of this program's structure as an organizational entity was planned to allow for great levels of flexibility. From its inception, the NetTel program has been an aid-funded development project designed to provide capacity building and technological transfer that will result in increases in access to ICT and telecommunications for citizens in participating African nations. Because these types of programs have a tendency to stagnate after the initial aid funds are exhausted, specific steps have been taken to adapt NetTel's structure so it is adapted to the cultural conditions in which the program is designed to be sustained. Examples of this include: (1) customizing the curriculum's use of case studies to include experiences from other African countries; (2) connecting NetTel with other complementary initiatives in the Africa region; and (3) adjusting the presentation and management of NetTel to reflect the large diversity of ethnicities represented by NetTel's stakeholders. The designers of this program have focused on keeping NetTel African-centric and shaped by African cultures so that African leadership for the program will organically evolve rather than be procedurally installed.

The network of partners is the life of the NetTel program. Without active participation, the program would stall. The drive that keeps partners motivated and involved can be characterized by the widely shared vision that NetTel is a viable and effective vehicle for stimulating social and economic development through strategic changes at the far reaching levels of ICT and telecom policy making and regulatory practice. The modes in which partners participate in NetTel's components include informal collaboration based on areas of interest, formal face-to-face gatherings, and virtual engagement via NetTel's digital work spaces (e.g., list serves, discussion forums, and a learning management system).

PRINCIPLES

As NetTel is intended to emerge through a process where partners self-organize according to interest, expertise, practice, and need, there are several guiding principles established by the network's founders. First and foremost is a commitment that *learning processes and the sharing of knowledge must be broadly shared*. In NetTel, this commitment is articulated through active outreach to expand networks for sharing knowledge and experience

between individuals, institutions, sectors, and nations. Where NetTel has developed curricula, this commitment is manifested in the use and development of open source and open content learning resources.

Another influential element of NetTel is the belief that problem solving must be contextualized. The transnational network does provide access to state-of-the-art solutions to common problems and the expertise to apply them; NetTel's partners have recognized that what may work well in one context may not translate well in another. In the words of one of NetTel's founding partners, "NetTel offers the opportunity for *African solutions to African problems*," which is very likely to be a much more sustainable and appropriate solution than one imported from elsewhere. The loose international network of experts from various sectors and disciplines provides NetTel's members with easy access to niche specialists who are available to contribute as needed on a scalable basis.

The third and final general principle guiding NetTel's direction is a deep *concern for quality*. In each of NetTel's components, the fundamental criterion for value for the investment of an activity is whether it brings about quality benefit to stakeholders. This attention to quality carries through to the design of conferences, meetings, publications, digital environments, training regimes, and degree curricula. Without a concentration on quality, NetTel's activities would lose credibility and result in lowered participation, which would facilitate the collapse of the network.

STRATEGIES

The strategies applied by those leading the NetTel program have precipitated from the structure and principles established by the network's founders. These strategies include the development and application of open content learning materials and open source technologies. Since most of Africa is underdeveloped, there are very real needs to exploit open content and open source resources as a way to attain widely dispersed capacity development opportunities. By avoiding the issue of proprietary knowledge, NetTel's partners are able to expand rapidly new ideas and approaches without licensing and copyright barriers. Through the use of open source software developed by the University of Western Cape (South Africa), NetTel trainers and technicians have introduced, installed and trained a growing number of African universities with Web-based learning management systems. This process has resulted in universities tightening their ICT policies, training more of their IT staff in advanced network management and code debugging, and aggregating demand for expanded capacity for collective negotiations with service providers.

As a network of interdisciplinary professionals, NetTel strives to learn from its own experience as well as that of its members. More than a learning organization, NetTel is trying to become an experiential learning, that is, an organization that routinely experiments with new ideas, reflects upon the experience, identifies improvements, and applies the lessons learned to new ideas. This organizational cycle of learning has been credited for many of the successes accomplished by NetTel.

One of the most effective strategies for ensuring rigor and quality in NetTel's components has been the use of international professional peer accountability. Here, the global peer networks for regulatory/policy-making and academic communities are frequently engaged to help support and encourage high level work on NetTel's research and training components. Particularly effective have been the informal channels for routing peer feedback and constructive comments aimed at helping all network members define, understand, and achieve international standards for performance.

LESSONS LEARNED

In several respects, NetTel is an experiment in holistic capacity building. There have been many instances where a decision was required between 1) a quick fix where technology or content could be imported to reconcile a problem and 2) a long-term solution where local human resources are developed and supported by a global consortium of experts so that local solutions can be crafted for local problems. And, in nearly every one of these instances, the latter choice was employed. Overtime, the NetTel experiment has rendered several interesting lessons learned the "hard way." Below are brief descriptions of these lessons grouped in four categories: (1) realities of transnational and trans-institutional sustainable development; (2) challenges in communication; (3) imperative of trust in ambiguous situations; and (4) the tricky balance of leadership in sustainable capacity building programs.

Expecting and Respecting Differences

Working in an international, trans-institutional context adds a level of complexity not to be underestimated. There are considerable differences among NetTel's global members in organizational structure, administrative procedures, customs, and underlying assumptions. These differences, while complicated and frustrating at times, present all network members opportunities to observe alternative approaches and perceptions. An interesting phenomenon noted among all represented nations and

institutions is that those individual NetTel members who are the most effective and efficient workers are always overbooked with similar projects. More than once has the comment been made by NetTel's leaders that if you want something done, give it to a busy person.

Global Communication

The NetTel program is actively engaged in seven time zones whose maximum difference is 11 hours. Beyond the complications of travel, the spread in time zones poses difficulties in scheduling voice and video conferencing. Much of NetTel's work is accomplished via asynchronous communication such as email, discussion forums and Web logs (blogs). However, there are many decision cycles that mandate real-time communication, which typically requires persons getting up early or staying up late to participate in a voice or video conference. Valuable lessons learned for the challenge of collaboration across multiple time zones include the appropriate use of available communication channels adjusted for the message, the moderation of frequency and tone of communications, balance of different cultural expectations in communication patterns, and a willingness to experiment with various communication technologies and strategies. Like any initiative, excellence in communication is imperative for success and while new technologies make global communication more accessible, excellence in communications eventually boils down to good habits practiced consistently among a group. Despite all the technology employed by NetTel, some "crises" have been best resolved through telephone calls and faxes.

Trust in Ambiguous Environments

NetTel is held together by a matrix of formal and informal commitments by individuals, organizations, and institutions. The commitments are built on trust; hence, trust is a cornerstone of the NetTel program. Many of NetTel's components are actively developed on the spot, such that implementation and policy decisions are often made when the need occurs. This is organic and sometimes unpredictable. The process of building and maintaining trust in an unpredictable, dynamic environment has emerged as a notable challenge. So far the network has responded well to being immersed in an ambiguous environment; however, there are times that partners get frustrated with a lack of firm policies, guidelines, and vision. This frustration is often seen at face-to-face meetings where a proposed course of action is shrouded in technical, administrative, and political uncertainty. A notable lesson learned from this issue is that those network members who do not deal well with uncertainty are learning from those who appear to thrive in it. Through the learning process of how to operate in ambiguous environments, members have developed a trust-building rapport. This skill is critical for the collaborative achievement of contractual obligations (i.e., deliverables). Clearly, the establishment and maintenance of trust is full-time, all-the-time task that is imperative to the sustained success of NetTel.

Ownership Begets Leadership

Considerable attention was given to the establishment of NetTel; this included strong leadership by an international team of facilitators. The team was assembled once NetTel was already underway. These leaders seemed to "step out of the wood work." However, most of these early NetTel leaders are extremely busy people who are not capable of maintaining high levels of involvement. As quickly as possible, effort was directed to transferring leadership to other NetTel members who are likely to be involved in and committed to NetTel over a longer period. Currently, NetTel is in this transfer process. Several techniques have been adopted as a way to facilitate more sustainable leadership. First, the original leadership team develops loosely packaged "straw man" visions of how a particular issue might be resolved. Then input from a work group of interested NetTel members modifies and improves the plan, which will eventually be implemented. This technique fosters ownership of the solutions by the emerging leaders. Another approach used by the original leadership team is the purposeful grouping and tasking of persons with specialized interests, skills, and positions. This practice runs slightly counter to the principle of allowing organic organization, but the results have been positive in that highly effective and efficient teams have been assembled for short-term projects. This approach has also been helpful in getting diverse partners who might not choose to work together to discover synergies and commonalities, a process that engenders broader trust. Finally, the original leadership tries to demonstrate an example of discouraging turf-building. The natural tendency for exclusive control over something such as a field, topic, or market has come up several times. It is thought, but so far untested, that the exclusivity tendency is best held in balance by the repeated and active endorsement of open content as a NetTel principle, and the commitment to broad inclusivity by NetTel's current leaders are required qualities that needed to be developed by NetTel's future leaders.

CONCLUSION

The NetTel enterprise is an experiment in the organic development of a sustainable capacity building program. So far, the process has gone well. While there have been

many successes achieved, there have also been many lessons learned through unsuccessful experiences. As NetTel rolls forward, it is set to expand in both content and membership. At some point, there will likely be a need for new structures in this program, and it is thought that the self-organizing elements in the NetTel partnership will provide adequate support for the resources for this not-too-far-off need. Regardless of how NetTel does indeed evolve, perhaps the most important aspect is whether NetTel is meeting its overall goal: to expand access to ICT and telecom services to all citizens in Africa. Reliable measurement of NetTel's success toward achieving this goal may not be possible, however accurate measurement may not matter as much as a continually revived passion to work towards a vision of digital inclusion of Africa.

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KEY TERMS

Capacity Building Program: A strategy for training targeted individuals in an organization, sector, or discipline to develop specific skills and knowledge base that can then be leveraged for achieving other, more broad goals.

Case Study: A systematic way of looking at what is happening, collecting data, analyzing information, and reporting the results.

Information Communication Technology: The technology required for information processing. In particular, the use of electronic computers and computer software to convert, store, process, transmit, and retrieve information.

Policy and Regulation: Policy is a plan of action for handling political issues. Regulation is the control of something by rules informed by the objectives set forth in policies.

Telecommunications: A broadly-dispersed communications network involving a transmitter, a medium (line), a channel imposed upon the medium, and a receiver.

USAID: United States Agency for International Development.

New Frontiers for The New Australian Institute of Music

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ECONOMIC RATIONALE

Universities, both public and private, in Australia (firmly encouraged by higher education authorities) are currently concerned with the mind-set, mechanisms, and practices that are necessary for universities to reinvent and reengineer themselves in order to become successful, surplus-making organizations. The Australian Institute of Music is no exception. Given the context of current economic pressures, this surplus-making exercise is fundamental to future growth, quality provision, and student/staff morale. Important matters such as changing mind-set from a "scarcity" to "abundance" mentality; encouraging new venture units ("skunk works") within elements; changing management style at all levels to facilitate entrepreneurial activities; effectively using outsourcing for teaching and administrative purposes; developing strategic alliances and networks; and developing the notion of thinking globally even though working locally; and requiring exploration.

To operate within the *new institute* within the *new economy* calls for a change in thinking and approach. There is a need for a new approach—a new organization. Limerick, Cunnington, and Crowther (1998) speak of a new form of organization that is required:

A new form of organisation is set to take us into the twenty-first century. It will have strategies, structures and cultures which are quite different from those with which we have been experimenting for the past decade and which are dramatically different from those that served us so well during the previous 20 years or more. It will offer new opportunities as well as new problems for management, and it will demand new mind sets, skills and competencies from those within it. (Limerick, 1998, p. 1)

This is hardly an easy task, with academic elements often opposed to, or at least uncomfortable with, entrepreneurship and with university bureaucrats experientially far removed from contemporary business practices. In the short term, it is necessary to empower university elements to develop entrepreneurial activities. Concurrently, the larger organization needs to reinvent itself attitudinally to deal with flexibility, a broader range of initiatives, and a focus on significant add-on value to its conventional operations and to deal with profit from its initiatives. The Australian Institute of Music has, from necessity, always been proactive in a range of innovative and experimental activities. Its survival (since 1968) has been predicated on the belief that ongoing innovation and change are ongoing commitments and must be maintained at all costs.

In order to put new initiatives in place and to respond quickly to new demands and opportunities, flexibility and autonomy are essential elements of a successful proposal. Kanter (1989) argues that winning the new game:

...requires faster action, more creative manoeuvring, more flexibility, and closer partnerships with employees and customers than was typical in the traditional corporate bureaucracy. It requires more agile, limber management that pursues opportunity without being bogged down by cumbersome structures or weighty procedures that impede action. Corporate giants, in short, must learn to dance. (Kanter, 1989, p. 20)

In these respects, higher education institutions must learn to dance anew by mastering new maneuvers, taking on new shapes, and searching for new opportunities. Speed is essential and timing imperative if market issues are to be satisfied for both the university and its clients.

PEDAGOGICAL AND DELIVERY ISSUES

The claim is that flexible delivery provides new alternatives for higher education providers and clients alike, especially opportunities to offer courses off-campus and offshore. Flexible delivery, then, is perceived as a marketing and development tool as well as a means of catering to local teaching and learning needs and requirements. The challenge to higher education management centers around creating the best methods of achieving diversity and reaching new markets in an increasingly competitive climate, and, at the same time, distributing programs while maintaining quality.

Flexible delivery is a subset of a larger issue, namely, organizational flexibility. The keys to organizational flexibility appear to be technology, customer satisfaction, and quality control. The technology issue is related both to the delivery mechanism, such as the use of Internet, CD-ROM, and e-mail, and the communication means. Customer satisfaction is related to the way courses are designed to maximize participation, especially in relation to duration and location. Quality control places the focus on both the perceived and real measures of delivery success, ensuring that courses maintain appropriate standards despite the range of delivery mechanisms. More formally, flexible delivery has been defined as follows:

An approach to vocational education and training which allows for the adoption of a range of learning strategies in a variety of learning environments to cater for differences in learning styles, learning interests and needs, and variations in learning opportunities. (Flexible Delivery Working Party, 1992, p. 47)

Flexible delivery then encompasses a wide range of approaches to teaching and learning. It emphasizes alternatives for students in an effort to maximize the quality of the teaching and learning process and create greater accessibility for a range of student types. For universities, the challenge of flexible delivery is the capacity to design, promote, deliver, and evaluate provision. In the tertiary context, it forces the provider to reassess traditional provision modes in terms of client needs and wants. It places the emphasis firmly on client issues and satisfaction and de-emphasizes provider demands.

Virtual courses are offered using some or all of the following:

- Innovative and interactive online delivery
- Intense periods of study (weekends, after hours)
- Industry recognized leaders (professional musicians, administrators, etc.)

- Synchronous communication (videoconferencing)
- Asynchronous communication (video, e-mail)
- Stylized print material—commercial quality of presentation
- CD self-contained learning packages (similar to online course material for students not online)
- CAL ("computer-aided learning," where the software teaches, trains, and also examines the students if required; staff can then be accessed via e-mail tutorials/videoconferencing)
- SMS (short message service) text message for student contact

This multimodal presentation format allows students the greatest access and choice of environment that most suits their life and learning styles. Students who need greater time to process information are ideally suited to CAL and online delivery, as they can spend as much time directly interfacing with the tutoring media as they require. Similarly, a student who needs less time on a particular course can choose to complete the coursework at a faster pace and employ their time elsewhere in their studies. Smith (2000) noted, "To retain customers, it is vital to focus on what people want and need rather than on what we want to sell to them" (Smith, 2000, p. 7).

The Virtual Institute of Music and The Virtual Institute of Management Sciences provide students with the opportunity to complete an eCertificate of Music at predegree level and a Master of Arts Management in a multimodal virtual environment utilizing all of the virtual modes noted. Most subjects offered within The Virtual Institute of Music and The Virtual Institute of Management Sciences are delivered in a variety of modes to suit the students' learning requirements

ESSENTIAL ELEMENTS

The virtual project was based on the work of Bofinger and Whateley (circa 2002) that centered around creating a greater range of options and flexibility for study. Four key vehicles were identified to help develop the approach to undergraduate and postgraduate offerings:

- The use of the *Internet*
- *Intensive* delivery of product
- Involvement of *industry* mentors
- Ongoing *innovation*

Individually, each of the elements is not groundbreaking—the practice of combining them, however, within the Australian context, is quite unique to music schools, and a significant achievement for The Australian Institute of Music.

Internet

The uses of the Internet in this project were threefold: as an asynchronous device; as a synchronous delivery medium; and by the use of software-controlled training packages.

Online studies are commonly of an asynchronous nature. The delivery and feedback is not given in real time but rather in a non-time-specific format. The lecture is generally located on a server and accessed by the student to study at a convenient time. Contact with the tutor predominantly is in the form of e-mail.

Synchronous lectures within higher education centers are mostly given using ISL (integrated system-wide learning) technology. This is only possible if both the lecturer and the students have access to an ISL theatre. After further software installations, communication can be made from desktop to desktop, and a lecturer can make real-time audiovisual contact with a single or group of students from an ISL-equipped room.

CAL refers to the use of commercial software teaching packages for the initial training and sometimes testing of the prescribed course. This allows for different rates of learning between students and creates much greater access time for students to pose questions and enter into informed academic debate with the appointed lecturer. The adaptation of *Rising Software's "Auralia"* has been used for the offering of all Musicianship courses at The Australian Institute of Music.

Intensive

By utilizing intensive delivery mechanisms, a range of new possibilities for course delivery is now available. Initiatives such as weekend-intensive delivery provides students with new options and, at the same time, increases the opportunities for industry-based staff to participate. This is an important issue for regional-based organizations.

Industry Mentors

Each higher education center will need to develop strategies and practices that best reflect the needs of their clients and are manageable within the existing resources, both physical and human. The human resource factor will become more and more important. Fewer full-time staff will be required. More emphasis will be placed on utilizing the expertise of visiting "satellite" sessional staff. These staff will act as industry mentors and be located throughout the world and access students in a variety of ways, including through intensive F2F (face-to-face), videoconferencing, teleconferencing, and electronic conversation. Kinsman (1990) urges that a series of contingency plans are put into place to ensure that students are well catered for: "Provided with these varied visions of the future, it is up to the individual or the institution to chose the most attractive permutation" (Kinsman, 1990, p. 189).

An exciting implication of flexible delivery is the potential to incorporate industry-based specialists into the teaching and assessing team.

Innovation

The utilization of a three-semester model allows for a second "mid-year" intake into the first year of the course. Turoff (1997) supports the faculty's initiative:

Ultimately a three semester system for Institutions of higher learning would be an extremely desirable situation for distance courses…On the other hand the four quarter system probably leads to a too compressed time scale for asynchronous communication oriented courses. (Turoff, 1997, p. 21)

This arrangement also makes possible the delivery of other institutional products on a subcontractual basis. Students may cross-enroll from other universities or from faculties within the university for credit toward their nominated program.

STAFFING ISSUES

In the new institute within the new economy, a range of staff options will become available. Developing the entrepreneurial environment with the right people contributing will be essential for growth and development.

The new demands that these endeavors place on the organization are considerable. Staff with little experience in postgraduate supervision and international student management, for example, will find the transition difficult.

The quality of the staff employed for the new endeavors will be a key factor in the outcome. The new institute, however, will need a new kind of staff member in the long term. Product delivery will be only one aspect of the new staff role. Staff will need to develop an entrepreneurial style, a real desire to innovate, a strong sense of income generation, and a need for independence and self-worth. Buckingham and Coffman (1999) stated it well: "In the entrepreneurial company … the critical striving talent is desire—a burning need for independence—and the critical thinking talent is focus" (Buckingham & Coffman, 1999, p. 100).

The recruitment process will need to reflect the true aims of the organization. It is not only about teaching, it will also be about creative thinking and innovative be-

havior. Candidates will need to be able to demonstrate this diverse range of skills. Staff currently in the conservatorium circuit have little experience or background in the areas cited. Finding the right people will be a significant challenge.

THE TECHNOLOGIES INCORPORATED

The creation of The Virtual Institute of Music and The Virtual Institute of Management Sciences came about as a result of a series of interconnected events. The development profile of The Virtual Conservatorium initiative at Central Queensland Conservatorium of Music (Bofinger and Whateley), a new management design at The Australian Institute of Music, the development of revitalized e-rollment mechanisms at The Australian Institute of Music, and growth in technology interest in general.

STUDENT FEEDBACK AND EVALUATION

Ongoing evaluation is a highly regarded aspect of The Virtual Institute of Music and The Virtual Institute of Management Sciences projects. Each course offering is evaluated formally on a 10-point scale, and a record of results is maintained. We anticipate an average of eight (out of a possible 10) to be the average ongoing result for the *eMAM* and seven (out of a possible 10) to be the average ongoing result for the eCertificate of Music.

Evaluations are conducted using an electronic proforma developed and managed by the e-administrator. Students are asked to complete an electronic evaluation immediately following the completion of the final assignment in each course.

E-Tutors have access to the collective information ordered and summarized by the e-administrator. This is used to ensure necessary modifications are made to the courses in operation where deemed necessary by the academic coordinator of the program.

Possibly more than ever before, this ongoing evaluation and feedback are critical. A significant quality assurance measurement within the new economy and the new institute will be client/customer satisfaction. Quality will need to be measured in terms of the levels of support students have for the activities, and the outcomes will be measured largely by what the students believe they have achieved. This is a fundamental shift for music schools—and not an easy one at that.

CONCLUSION

The Virtual Institute of Music and The Virtual Institute of Management Sciences project have the potential of providing, and have already achieved, a certain competitive edge in the national and international context. Given the fact that it is a new business rationale for tertiary music delivery in Australia, it will certainly make other conservatoria rethink they way they operate. This is already evidenced by the fact that three similar institutions have already requested support from the authors in establishing similar designs and projects.

In a time of tertiary music cutbacks, reductions, and high deficits, it is indeed pleasing to see an entity within the industry that is reversing the trends in terms of growth and operation and, at the same time, making a significant contribution to the review and redevelopment of future practice. The key to future success will be maintaining an environment of innovation and creative thinking that will attract capable and forward-thinking personnel and will keep already achieving members of staff in place and motivated.

The Virtual Institute of Music and The Virtual Institute of Management Sciences are able to exist by not allowing themselves to be boxed in by the mentality that in the arts, virtual education only means isolated, individual, personal, and computer-oriented education. The mass media portrays this negative image that virtual and innovative technologies are synonymous with exclusive interaction with a computer. This image suits the Hollywood stereo-typecast scenario, but on the whole bears little resemblance to the impact of the overall possibilities of the virtual landscape.

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KEY TERMS

Asynchronous Media: Delayed delivery of media (e.g., video, e-mail).

Computer-Aided Learning (CAL): Where the software teaches, trains, and also examines the students if required.

E-Administrator: Online course or program administrator.

E-Rollment: Online student enrollment.

E-Tutor: Off-campus, online academic tutor.

eCertificate: Virtual mode of enrollment for Certificate II of Music and Certificate IV of Music.

eMAM: Virtual mode of enrollment for Master of Arts Administration.

F2F: Face-to-face, with communication occurring in the same physical domain.

ISL: Integrated system-wide learning; real-time videoconferencing and multimedia streaming system.

Skunk Works: New venture units with a role to explore beyond the perceived boundaries of the organization.

SMS: Short message service; mobile phone text message protocol.

Synchronous Media: Real-time delivery of media (e.g., videoconferencing).

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One Village One Computer Campaign in India

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One Village One Computer Project Trust, India

INTRODUCTION

For social development to take place in rural areas it is necessary to involve the people and assist them in becoming technology-enabled and knowledge-enabled because knowledge is always held collectively (Hayek, 1945). It is said that the growing digital divide has added one more dimension to the already skewed process of development-underdevelopment (Castells, 2000). In reality however it has more to do with the deprivation of information and knowledge than the non-availability of hardware and connectivity. To overcome this, it is necessary to look from a fresh perspective and introduce a new socio-organizational model that builds on the principles of Information Society (Castells, 2000), Economics of Knowledge (Machlup, 1962; Arthur, 1985; Romer, 1990) and Social Capital (Coleman, 1988; Putnam, 1995) to ensure better development of human and social capital.

BACKGROUND

One Village One Computer (1V1C) is an IT for development concept for introducing IT solutions in backward areas and for underprivileged communities. The project aims at developing a sustainable IT-based development model that integrates IT in the mass struggles working on the problems of underdevelopment in the most backward regions.

1V1C has developed new methods of mass IT education and training for village youth and formation of community-owned IT Centers. The services that are offered through the IT Centers are not confined to a few technology services that are generally offered through the tech centers, but are wider in scope covering people's needs and issues. 1V1C strives to facilitate the vertical knowledge flows. It is the flow of subject knowledge held by experts to the contextual knowledge held by people and vice versa that can lead to development. So far IT is dominantly used to IT-enable corporations and businesses, software are essentially developed to facilitate industrial and business processes. 1V1C attempts to IT-enable the social processes and create developmental software. This software will be put in the public domain to make it available to the society as free software. 1V1C acts as a network, which offers the existing social movements, Non Government Organizations (NGO) and Community based Organizations (CBO) to IT-enable themselves. 1V1C's intervention leads to leadership development, widening and deepening of the scope and scale of these organizations. The activities of 1V1C lead to the development of enough social capital assets in a given locality making possible the formation of an IT Center at a negligible cost. The IT Center is a community-owned cooperative and is an autonomous body. With this democratic and flat structure the rights of local communities over information and knowledge resources are safeguarded. The 1V1C model can be adopted in varied social, geographical situations. It opens the window of the world to the local community while keeping their basic characteristics intact. It offers them access to the world level cutting-edge knowledge which they can use, after appropriate contextualization, for their development and also a facility to transmit their own traditional, as well as newly developed, knowledge to the world community.

THE PROJECT

The first grassroots experiment of One Village One Computer was conducted in village Mod, District Nandurbar of state of Maharashtra in India, in the year 2000. A database of 3,000 landless laborers was collected. The collection of this data and its interpretation highlighted problems confronting destitute senior citizens, women and patients. This led the laborers to organized agitation and make structured presentations of their problems, which were resolved immediately with the help of the local landless laborer's union.

In the same year, this understanding guided the work with tribal women in district Thane, and women in district Pune of state of Maharashtra in India. Extensive data regarding ration cards for the Public Distribution System (PDS), availability of food grains, functioning of ration shops under PDS, distribution of kerosene and black marketing of ration goods, etc., was collected from selected areas of ten districts including tribal dominated areas. Because of this concrete information, tribal women in Thane district could ensure that every family got a ration card, and as a result the women in district Pune managed to restore over 2,500 ration cards that had been arbitrarily cut out.

It was decided to situate this learning and success at one location, and a Resource Centre was established in the village of Agroli in New Mumbai on 6th January 2002. This area of New Mumbai, covering 95 villages, was chosen for the pilot, as this represented a classic example of the "digital divide." Thirty years ago, a mega city was thrust on this agrarian society without any adequate rehabilitation.

There have been quite a few attempts throughout the world to instigate initiatives around ICT for development. However closer study of many attempts, reflects that people's involvement and their real needs were often never really taken into consideration when attempting to use ICT for development. Most often these initiatives were focused around implementing inappropriate readymade ICT solutions and packages, or in setting up an ICT service centre which was run and managed by private individuals or enterprises that offered limited "fee for service" options. However, many people have not imbibed the culture of using the principles and skills of ICT for their very survival. In reality, they have not been able to learn and draw from these techniques and skills and apply them to improve their own conditions at the village level particularly for primary concerns associated with daily living. Issues pertaining to unemployment, water, and women's empowerment are still crucial problems affecting rural India's daily life, and the acquired knowledge of ICT is not being effectively utilized.

Further, most of the applications of ICT for local development in these disadvantaged situations have adopted a "top-down" approach and treated the local communities as mere receivers of a service and not integrated them into the process or developed the human capital or the social fibre of the community to ensure sustainable and long lasting change. Hence whilst there has been constant talk of how information technology has revolutionized business processes of large corporations, thereby enabling them to achieve better results or make more profits, almost nobody has even attempted to explore how social processes can be enhanced and made more powerful through the use of ICT techniques and solutions.

1V1C does not talk of the spread of "hi tech" technology and solutions of expensive investments. Instead it talks of providing to rural India the very basic core functions, which urban educated people often take for granted. Its aim is to make a positive impact on the many lives of rural India through the use of very basic techniques and inputs of the ICT world that offer rural India the capacity to tackle significant problems.

The basic thinking under which 1V1C was conceived was to develop an innovative socio-organizational concept that used ICT techniques and principles in building and supporting a people's movement and a rural activism to effectively campaign for and implement people-centric development at the village level.

Although working towards the creation of a self-sustaining open platform for solving important social concerns through the community-oriented use of information technology, 1V1C was always conscious that the techniques of and principles of ICT were to be used as an enabler, an improviser to increase knowledge, skill, reach and impact. These are the aims that the people's movements and organizations are constantly undertaking in rural India. They are aimed at giving a greater momentum to the existing struggles of people at the village level and the development of initiatives in rural communities.

1V1C's efforts have been towards the teaching and organizing of village communities to collect information and data relevant to their own particular issues and concerns. The communities where 1V1C has worked have tackled locally relevant problems such as the lack of work. These efforts have been supported by organized and systematic data collection on unemployment in the villages, and in turn this information has been used to lobby for the release of more work under the government's employment guarantee scheme. Local communities have also been taught the value of the principles and techniques of ICT such as systematic and reliable data collection and fact finding on their core issues like the Below Poverty Line numbers in villages, demographic representation of population. These data can in turn be used effectively to accelerate people's struggles on issues such as the Public Distribution System, housing schemes for homeless and old farmer pension schemes.

1V1C has worked to bring in specially designed water management software to local communities and train them on its effective use. Armed with these results and findings the local village groups and elected representatives have lobbied with the government for more investment in water harvesting programs. Another issue is that of health, particularly in relation to women and children. Here too systematic data collected on the occurrence of the relevant problems when analyzed and presented to the local health authorities, was enough to convince the state health department to organize health camps to ensure the health of the community. Such examples demonstrated at the community level have proved to the local community the value of principles and techniques of reliable data collection and the science of ICT.

1V1C's work involves the organization of mass training camps to generate an interest among the local communities on the various uses of ICT to benefit their own lives. 1V1C works through existing people's organizations, elected representatives and the village community at large. It often involves youth and works towards forming social structures such as computer support committees (CSC) who are interested in using the ICT methodology

and techniques to try and solve local social concerns. Only when such attempts to use ICT to solve social issues at the village level are efforts made to gradually move towards forming a 1V1C centre.

The 1V1C process gives village leaders and communities a new boost to tackle their locally relevant issues. Since by conception the effort is rooted in the involvement of rural communities it also contributes to leadership development, capacity building and development of the human capital which results in the overall building of social capital in society.

A very interesting aspect of 1V1C's idea is that of cooperative structure. This cooperation is the emergent property of the community itself (Axelrod, 1984). For example the ICT initiative, Seva Kendra, is not owned by any individual or set of individuals, but by a cooperative structure of the local people. A core Computer Support Committee (CSC) is elected whose membership is by rotation and it is the responsibility of this committee to manage the center. The CSC does not employ paid staff to manage these centers. The elected CSC, particularly youth and women members are responsible of running and managing the center. 1V1C's central team play a crucial role in developing the capacity and ability of these elected people to learn to use ICT to solve the community issues and these people in turn train and assist the village people to do the same. The information generated belongs to the people in general and hence they have full ownership and access to it. Thus the ICT Seva Kendra gains momentum of its own and turns itself on autopilot without requiring continuous external support.

Whilst the democratic way of functioning within villages and districts works through the mechanism described above, the idea of 1V1C is to help villages connect beyond themselves to other villages, districts and maybe even beyond this when technology advancement and accessibility grows. The concept is about forming a widespread and deeply embedded 1V1C network (a social network) wherein learning, experiences, and models can be shared across villages and districts and even states in India, This effort will then lead to actual empowerment and change by the people and for the people of rural India. The conception of 1V1C centers requires the local population to be convinced of the worth and value of ICT for their villages and districts and hence create a willingness to invest in it. That way, the local village communities have the greatest stake in ensuring that this investment works for them.

So far 1V1C has started work in several districts in the State of Maharashtra in India and has set up the 5 ICT Seva Kendra's across 5 districts. Through the ICT Seva Kendra issues that are the concerns of the local population have been identified by the populations and information about the same (in terms of extent and reach) is collected by 1V1C

initiated by Computer Support Committees (CSCs), comprised of local people who have a stake in these issues.

Following are some of the problems that a 1V1C approach typically addresses:

1. **Drought and scarcity of water**
2. **Employment Guarantee Scheme:** In India public work is provided to needy people from rural areas through this scheme by way of various government agencies. In practice very few people get work and there are many irregularities in implementation of the government efforts
3. **Primary Health Centers:** Many health services that are offered through government-run village outlets fail to be implemented
4. **Market rates for agricultural produce:** Gaps in information and the lack of availability of timely information of market prices leads to enormous losses for local farmers
5. **Gender divide:** Inequality in access, training and opportunity for women is more apparent in the village life in India. Such inequality touches every aspect of social, economic and cultural life in these situations
6. **Lack of information about government schemes:** Many people who are the primary target of government schemes are not aware of them or how to avail themselves of the benefits

NEXT PHASE

In the next period, 1V1C proposes to support the development of relevant low cost software that can be used by the local community to resolve local problems through its own efforts. 1V1C attempts to enable the social processes through ICT and to create relevant free/open-source developmental software. This software will be put in the public domain to make it available to the society as free software. Such software can be developed by through the collective expertise of technology people, villagers and organizations/people having relevant functional expertise. These products can then improve the efficacy of employment guarantee schemes, the right to Information, water auditing and water management, providing market rates to farmers and a range of community activities. All of these developments will incorporate people's knowledge and experience which 1V1C collects and codes into replicable models for other organizations and groups to use. JalChitra and Akruti-1V1C Indian Languages Software are examples of such software and these are already in use. Thus the collective action itself acts as the foundation for creation of replicable knowledge (Arrow, 1962).

CONCLUSION

1V1C is an attempt to protect rural society and village communities from the downsides of the reckless impacts of ICT-led globalization, but at the same time it avoids the pitfalls of parochialism associated with a fruitless attempt to insulate the village communities from the outside world.

The model of 1V1C is inspired by the principles of knowledge economics, particularly the *Endogenous Growth Theory* (Romer, 1986, 1990; Lucas, 1988). This theory tells us that technology and innovations are not just external elements, but are an integral part of the economic process itself. 1V1C firmly believes that ICT is not an external irresistible force, but a force shaped by the collective choices by a particular society.

The advances in the endogenous growth theory in the last two decades have dispelled the widely held belief that capital investment is the only driver of economic growth. It has highlighted the criticality of investment in the *human capital and technological change* as the factor responsible for the major share of the economic growth.

ICT as we know today is the product of *quest for freedom* in the field of technology. A few decades ago, computer technology was not accessible by the common people. The birth of personal computer was a sort of rebellion of freedom-loving technologists against these monopolist tendencies. The birth and spread of the Internet threw open a world-wide information and communication technology net with the potential for challenging centralised, economic, bureaucratic and political controls. The birth of Free Software Movement and GNU Linux operating system are examples of the desires by many to balance the tendency for ICT to increase the centralization of economic, social and cultural identity.

The *Free Software Movement* can be considered as a modern, knowledge-based struggle of the people to use ICT in ways that liberates community, protects their identity and lays the foundation for increased self-reliance. In the early part of the 21st century, there has been an ongoing and intense struggle by community activists and global movements against the privatization of the Internet. There have been attempts by big corporations and monopolists all over the world to restrict and curtail the Internet for their narrow selfish interests. An important first step in balancing this tendency has been achieved by the freedom-loving democratic technology community world over united against this attempt. However, if an appropriate balance is to be achieved, it is necessary for communities everywhere to be aware of the potential for increased centralization from the increasing application of ICT and to take a stand on these issues.

A significant development with the evolution of ICT is the resultant emergence of *new organizational structures*, which are not merely modified incarnations of industrial age organizations. These new organizational forms, which include virtual and network forms of organization can be termed as organizations of the future and they are being vigorously studied throughout the world (Powell, 1990). The story of creation and development of the Internet shows that cooperation and freedom of information are more essential features for promoting innovations in a society than competition and property rights. Hence 1V1C has adopted a completely democratic and cooperative structure. It actively stands for the right of local communities to have control over their information and knowledge resources.

In India, the social sector has remained to a large extent unconnected with the cutting-edge knowledge and technology in general and ICT in particular. However it is being increasingly recognized that the connection of modern knowledge to local environments, the necessary contextual understanding and demonstration at a local level are important, beneficial steps for local communities. It is not just a question of using the advanced technology as a given, but social shaping of the technology itself that is of value.

1V1C's idea is to attack the problem of underdevelopment at the grassroots level and to bring backward communities to the forefront of development. The 1V1C approach aims to do this by raising human capital assets and social capital through the introduction of new socio-organizational models that use ICT to facilitate a two-way "top to bottom" and "bottom to top" free vertical flow of knowledge.

ICT-enabled Social Capital can be a weapon in the fight against backwardness and backward situations throughout the world. In developing societies, private entrepreneurial initiatives driven by market incentives alone have limited success. For diffusion of technologies and preparing the society for the networked world, collective and social entrepreneurial models are necessary. 1V1C aims to tap the social capital in grassroots communities for diffusion of ICT and subsequently employs the technology-enabled social capital to provide greater control to community members over their lives.

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KEY TERMS

Akruti: A brand name of Indian language software. (Literal meaning of Akruti is figure.)

CSC: Computer Support Committees formed around "IT Seva Kendra" to work on specific community issues and consisting of village volunteers.

ICT Seva Kendra: It is a community owned cooperative entity that nurtures learning and innovation in the community.

JalChitra: A village water resources mapping and water auditing software developed by Dr. Vikram Vyas. (Literal meaning of Jal is water and Chitra is picture.)

Open and Distance Programme for Rural Women

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THE CONTEXT

In the Upper Nkam culture in Cameroon, with about 200,000 inhabitants, women (51% of the population) are the core of the community, in charge, from generation to generation, of the management of the household and the transmission of cultural heritage. But when comes the time to take decisions that can influence the future of the community, because of the weakness of their resources, their illiteracy and cultural inhibitions, they are marginalised. Considering its advantages, open and distance learning seems to be the best solution to solve this problem.

The initiative described here, supported financially by the Seed Grant Smalkl Innovative Project of Global Knowledge Partnership, aims to use open and distance training programme through radio broadcastings and video tapes, to empower rural women by giving them the skills to be able to implement income generating activities and to practice effective local leadership.

METHODOLOGY

First of all, we tried trough a participative approach, to identify the real needs of women that could be provided to through distance learning. After that, to enhance the appropriation of the project by the community, we identified good partners among groups of women and chose to work with them. We then elaborated a training programme and the training material most suitable to transmit the messages. After choosing the radio as one of the best ways to train the women (Daly, 2003; FAO, 2001; Girard, 2003), we set a contract with a community radio station usually listened to by the women. The training programme was then broadcast over that community radio.

Stakeholders in the Initiative

The main stakeholders in the initiative and their duties were:

- **PROTEGE QV:** Owner, in charge of the overall coordination, the administrative duties, the recruitment of experts, the contacts with the local women groups, the follow up and the evaluation.
- **ALTERNATIVE SANTE:** Partner, responsible for the medical content of the project.
- **RADIO RURALE FOTOUNI:** Partner, in charge of the broadcastings.
- **Women Groups:** Beneficiaries.
- **Local Trainers:** From women groups, in charge of transmission of messages to local groups, and support of the sustainability of the project.

In the Grassfield region of Cameroon, more than 90% of the women are members of at least one association or other women group. The Upper Nkam division of Cameroon has more than 100 women groups, with at least 30 members and with regular meetings on weekly or monthly basis. We chose those women groups as one of the best ways to contact the beneficiaries and inform the about the project. On the basis of their involvement in current development activities, ten women groups (653 members overall) were identified as potential partners.

Identification of the Real Needs

To ensure the relevancy of the training content, we used a participatory approach through field survey to identify the real needs of women. The questions in the survey form aimed to find obstacles to efficient involvement of women, and the most current needs in terms of training and support. It also permitted evaluation of the feasibility of different solutions (how many people have a radio set, what language is most suitable, what days and at what time do they listen to the radio, how many can read and write, what are the subjects they want to be informed on, etc.).

The survey was done by interviewing 500 women in the division during a week. Out of the 500 forms completed, 472 were valid and could be processed. The completed forms were processed and a report of that investigation was published.

Some important results of the survey are as follows:

On the Sample

- The women interviewed came from 31 villages.
- 67.7 % of the interviewed women were aged between 26 and 50 years.
- 50% of them had not completed elementary school.
- 44% were in a polygamous marriage.
- The most spoken language was Féfé (77%), a local language, followed by French (72%).

On Women Activities

- The most current activity was farming (53%), followed by selling of products (24%).
- 85.6% of the interviewed women declared that the main difficulty encountered was finding funds for their businesses.

On the Radio

- The radio stations with the highest audience ratings are the national radio (CRTV) and Radio Rurale FOTOUNI.
- Women listened to the radio on Saturdays and Sundays especially before 9:00 a.m. and after 6:00 p.m.
- 52% of the interviewed women thought that there was a lack of information on how to prevent diseases like malaria, diarrhoea, cardiovascular diseases, and menopause related diseases.
- The best ways to inform on family health were group discussions (62%), health centers (25%), radio (12%).

On Local Leadership

- 98% of the interviewed women were members of at least one association.
- Only women who have completed elementary school and the first cycle and secondary school were in the staff of mixed associations (women and men).
- To be better involved in municipal councils, women knew that they needed some training.

Elaboration of the Training Programme and Material

To provide the needs identified through the survey, three main subjects were identified: local leadership, family health, and income generating activities. A training program was elaborated with three main axes:

- Using women groups for lobbying and practising leadership,
- Creation and management of Income Generating Activities (IGA), and
- Family health.

Table 1. Training material

THEME	AIMS	RADIO PROGRAMS	VIDEOS	HANDBOOKS
Income generating activities	How to create and run income generating activities in rural area	What is an IGA* IGA at home Importance of IGA for women Role of information to promote IGA Finding funds for IGA Using cooperatives to fund an IGA	Funding an IGA with a cooperative, "MC² of BANKA", Funding with NJANGI, International Women's Day fair Pottery Women IGAs	How to evaluate the fund needs to start a business Finding funds to start a business
Family health	First aid, family health and care	Why have interest in health Girls and women health (part 1) Girls and women health (part 2) Cardio-vascular diseases (part 1) Cardio-vascular diseases (part 2) The role of nutrition in human health	Mother to child transmission in the community Child health care in little towns: Upper Nkam division example Child way from home to hospital Sexual education	Communication methods Children health Women health Cardio-vascular diseases
Local leadership	Using women groups for lobbying	Presentation of the program The groups authorized by the Cameroonian law How to create an association How to register an association How to register a GIC*** The role of information in local leadership The role of women groups in development (part 1) The role of women groups in development (part 2) Importance of school to girls	Speaking in public "GIC Essayons Voir"	How to create an association The role of women groups in development How to organize a training

*IGA: Income Generating Activity

To satisfy this programme, the training materials prepared comprised radio programs, videos and handbooks on the three subjects. All are reported in Table 1.

Training

Three levels of training were implemented:

• The first was an open and free one for all the women listening to Radio FOTOUNI,
• The second was through three group discussions organised at Bafang town in Upper Nkam division, and
• The third level stood for training ten future trainers.

Radio Broadcastings

The name chosen for the program was "Woman and proud!!" Three days per week were chosen to broadcast the training program:

• Tuesday at 6.15p.m. on "income generating activities",
• Thursday at 6.15p.m. on "family health",
• Saturday at 6.15 on "local leadership".

From the October 4, 2003 to December 31, 2003, 24 radio programs were broadcasted by Radio FOTOUNI (see Table 1).

Training of Trainers

To ensure the sustainability of the initiative, ten women, representatives of the partner groups were selected to be trained as future trainers on:

• The different communication methods;
• How to prepare a radio program given a precise subject, and how to record it, taking into account the context and the common language of the listeners;
• How to prepare a group discussion and moderate it;
• How to organise a training session;

• How to help women evaluate the financial needs for their business; and
• The tools to help women groups be declared in conformity with the legislation.

To practise, they recorded three of the 24 radio programs broadcasted during the project and assisted the experts during the group discussions.

Group Discussions

The Upper Nkam division of Cameroon has more than 100 women associations. To reinforce what had been aired on radio broadcastings and to raise up a maximum of questions, women groups were put together to attend group discussions.

Three group discussions were organised on the main subjects:

• The role of women groups in the development of the community,
• Family health, and
• How to find funds to start or to run an income generating activity.

The group discussions were run in Bafang town in the town hall. About 100 women attended the group discussions. Videos were used during the discussions to enhance the messages. The group of ten newly trained trained assisted the experts in running the group discussions. Three of them worked in a group on local leadership, four in the family health group and three in the funding of activities group.

Follow Up and Evaluation

A regular follow up was made through meetings of the staff, using the indicators. How do we evaluate work done? Indicators related to ICT are reported in Table 2.

The sustainability of the initiative will come from the local trainers and the outputs. A batch of 10 local trainers from the women group partners has been formed. The

Table 2. Indicators related to ICTs

Indicators	Achievements
Training content relevancy	Ensured due to the identification of needs through a field survey
Availability of ICT	The radio is the most common and can be found in %
Socio-cultural acceptability	The women trained as local trainers are from the community and will be cuter in addressing local problems and speaking the same language, knowing the local socio-cultural conditions

have created a group supported by their ten women groups and the council. PROTEGE QV and ALTERNATIVE SANTE partly continue to support this group materially, and regularly refresh courses to that group, so that they can train and assist women efficiently.

As from after the group discussion held on the 14th December 2003, 5 of the 10 trainers have already organised group discussions in their own groups. The material produced during the training will help in training other people or to enhance the training already received. That material can be used for training in women group in the Upper Nkam division or elsewhere in the world. Some of the material, as reports, handbooks and videos will be put on the Internet to be used by others. As the material produced is co-owned by PROTEGE QV and GKP, we are sure that the material will be published among GKP members, giving the opportunity to share resources.

Changes Observed and Gender Issues

The changes seen up to date are mostly on local leadership. The impact on income generating activities will be more perceptible in the future as indicated in the report. Another field survey six months after the end of the project is planned to evaluate the longitudinal impacts. During the field survey, 72.8% of the women interviewed thought that one of the main reasons that kept women far from the decision-making process was the lack of education and training.

The activities in this project aimed to give women training on a sustainable basis. One of the activities to empower women was the training of a batch of local trainers who would progressively train the 653 members of the 10 women partner groups, on regular basis on a subject of their concern, and after that train other women groups. By providing the training and information this way the women will enhance their empowerment and self reliance.

Being able to train with local trainers was a proof of the reinforcement of their capacity in their ability to speak in public and to transmit messages and their feelings (local leadership). Each trainer was selected to represent a women's group on the basis of her ability to coordinate training activities within the group. During the meeting with the leaders of the groups, an agreement was made so that the group discussions could be organised within the group, animated by the local trainer. Up to date, all the group discussions have been organised within their groups and sent report to us.

The batch of trainers constitutes role models for other women. When their voices are heard over the radio, their neighbourhood and mates congratulate them, and their children are proud to be recognised at school (reported by three trainers). At the time of publication we have regis-

tered 15 requests of women who also want to become trainers.

To ensure an equal benefit of the project to both men and women, the core of the program was delivered on radio broadcasts which was open to everyone. In rural areas, there are very few leisure activities. At the end of the day, after farming activities, almost all the households listen to the radio. The time chosen to broadcast programs (at 6:15 p.m., three times per week) gave the opportunity to all the members of the family to listen to the program. As seen in Table 1, all except five programs (numbers 3, 8, 9, 19 and 20) were addressed specifically to women issues; all the other themes presented were of interest to both men and women.

Women and girls were not disadvantaged by the project:

- The direct beneficiaries of the group discussions were the women of the ten partner groups;
- The field survey made to ensure the relevancy of the training subject was made by interviewing only women; and
- All the local trainers were women

The project gave opportunity to increase women's ability to take charge of their own economic lives: (through the themes related to how to create or develop income generating activities)

The micro-bank MC² BANKA, received new customers who attest that they got the information on the services offered from the radio programs "Women and proud" run during the project (reported by the micro-bank manager). This enhanced their access to credit to develop their activities.

The themes on leadership broadcast during the project gave women the courage to raise their voices and express their needs; the themes on health made them better able to ensure a better health for the family. They gained self confidence. During the International Women's Day activities, three of the local trainers were part of the group of facilitators who were promoting a campaign on how to prevent HIV AIDS. Usually, those campaigns were only made by civil servants.

As a result of the program, the women participants learned skills for collaborative action. The representatives of the ten women partner groups asked for an appointment with the mayor of Bafang, to present their problems and some ideas on how they can keep the city clean (reported by the mayor). The trainers have already helped six associations to register legally and have an official existence. One of the women partner associations named "GIC Essayons Voir" has created a network named "NJANKEU PAANGOP" in the village of BABOUANTOU to reinforce women activities and act collectively.

LESSONS LEARNED

- The results obtained from the data processing comfort us with the choice to use radio as the medium to train rural women;
- It is very hazardous to presume what are the most important problems in a rural community;
- Women were very enthusiastic to join the initiative;
- The newly trained trainers feel really responsible for their new roles;
- The duration of the project (four months only) was not enough to really improve the short term development, but able to stimulate new attitudes from women.

- One of the best lessons learned is the power of the radio. As someone may say, "the radio is the rural internet in Africa."

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Participatory 3D Modelling

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INTRODUCTION

Mapping is a fundamental way for displaying spatial human cognition. "It is a representational medium that both has a history and is part of the practice of history" (Herrington, 2003). For centuries and increasingly with the advent of Geographic Information Technologies (GIT), graphic representations of part or the whole of Earth in cartographic, electronic, two or three dimensional formats have been playing significant roles as media (Sui & Goodchild, 2001) used to store, display and convey information and as basis of analysis for decision support.

BACKGROUND

In the past maps have been made primarily to serve precise tasks like describing discoveries, navigating space, defining boundaries, registering ownership and locating resources. In the early '90s, Monmonier (1996, p. 2) wrote that "*a single map is one of an indefinitely large number of graphical models of the spatial aspects of reality that might be produced for the same situation or from the same data.*"

Changes have occurred since GIT have become accessible to civil society and graphic representations of space have been used as channels for two-way communication purposes to support social learning, dialogue and negotiation processes.

The participatory use of maps started in the late '80s. At that time, development practitioners were inclined to adopt PRA[1] *sketch mapping* tools (Mascarenhas et al., 1991) rather than venturing into more complex, demanding and time consuming *scale mapping*, particularly because preference was given to eliciting village dynamics and facilitating communication between insiders and outsiders (researchers), rather than to courses of action enabling communities to interact efficiently with policymakers (Rambaldi et al., 2002a). In addition, in many developing countries aerial photography, satellite imagery and official large-scale topographic maps were under governmental control and their access restricted because of national security concerns.

The situation changed in the '90s, with the diffusion of modern GIT including geographic information systems (GIS), low-cost global positioning systems (GPS), remote sensing image analysis software, open access to data via the Internet and steadily decreasing cost of hardware. Spatial data, previously controlled by government institutions became available to and mastered by non-governmental and community-based organisations, minority groups and sectors of society traditionally disenfranchised by maps and marginalized from decision-making processes (Fox et al., 2003). This new environment facilitated the integration of GIT into community-centred initiatives particularly to deal with spatial information and communication management (ICM). Practitioners and researchers around the world have been working on different approaches making use of a variety of GIT, but all sharing the goals of placing ordinary people in the position to generate, analyse, manage and exchange georeferenced data, integrate multiple realities and diverse forms of information to foster social learning and broaden public participation across socio-economic contexts, locations and sectors. This has spurred a rapid development in the management of spatial multimedia information through what is generally termed as Public Participation GIS (PPGIS), where maps are conceived as interactive vehicles for discussion and information exchange, are physical or virtual, in 2-or 3-Dimensional formats and are enriched by an array of data types including sound and images (Aberley et al., 2002).

Large scale maps (> 1:20,000 scale) and physical or digital terrain elevation models have been used for conducting collaborative research (Hampson et al., 2003; Tran Trong Hieu et al., 2002; Martin et al., 2001; Tan-Kim-Yong, 1994 and 1992), community-based planning, monitoring change, asserting territorial claims (McCall, 2004; Bersalona et al., 2004; Rambaldi et al., 2002a; Zingapan et al., 1999; Poole, 1995), managing territorial disputes and supporting related negotiations (Chacon, 2003; Carton, 2002a; Rambaldi et al., 2002b; Wood, 2000; Johnson, 1999) and consultative policy making (Carton, 2002b). While most authors point to the effectiveness of GIT & GIS used in a participative mode, McCall (2004), Fox (2003), Rambaldi (2002a), Abbot (1998) and Rundstrom (1995) call for caution as these may lead to increased conflict, resource privatization, and loss of common property.

PARTICIPATORY 3D MODELS

Participatory 3D Modelling (P3DM) is a relatively new communicative facilitation method conceived to support collaborative processes related mainly to resource use and tenure and aimed at facilitating grassroots participation in problem analysis and decision-making.

P3DM integrates people's knowledge and spatial information (contour lines) to produce stand-alone scale relief models that have proved to be user-friendly and relatively accurate data storage and analysis devices and at the same time excellent communication media. Relief models works best when used jointly with GPS and GIS facilities.

Participatory 3D models are manufactured at the village level based on the merger of traditional spatial information (elevation contours) and peoples' spatial knowledge (cognitive maps). Elevation contours are used as templates for cutting out sheets of carton board of a given thickness (i.e., expressing the vertical scale). Cut-out sheets are progressively superimposed to build the relief. Based on their spatial cognition, informants depict land use and cover and other features on the model by the use of pushpins (points), yarns (lines) and paint (polygons). Once the model is completed, a scaled grid is applied to transpose spatial and geo-referenced data into GIS. The grid offers on one hand the opportunity of adding geo-coded data generated by GPS readings or obtained from secondary sources to the model, and on the other hand to take approximate coordinates on the model and verify these on the ground by means of GPS. This is extremely useful when models are used to support boundary negotiations.

P3DM brings GIS potentials closer to rural communities and bridges the gap existing between externally supported GIS and capacities found among marginalised,

Figure 1. Discovery learning, the first step for informed decision-making

isolated, and frequently natural resource-dependent communities.

The manufacture of a 3D model leads participants through a collective learning process (Figure 1) to the visualization of their economic and cultural domains in the form of scaled and geo-referenced relief models which can be used subsequently for different purposes.

One major constraint of physical elevation models is their limited mobility. Their use is therefore confined to those in the position to convene around them.

To upscale its utilization, P3DM is best integrated with GPS and GIS. Such integration allows adding precisely geo-referenced data, conducting additional analysis and producing impressive cartographic outputs. Resulting synergies make community knowledge portable and sharable at all levels of society and more importantly add veracity and authority to it. This paves the way for peer-to-peer dialogue and more balanced power-sharing when territorial issues are at stake.

Practitioners using relief models at the community level in the Philippines (Rambaldi et al., 2002a and 2002b; PAFID, 2001; Zingapan et al., 1999), Vietnam (Rambaldi et al., 2003; Hardcastle et al., 2004), Thailand (Tan-Kim-Yong, 1992; Hoare et al., 2002) and India (Chakraborty, 2003), have experienced that when informants are provided with a blank relief model instead of a blank contour map or a blank sheet of paper, they can easily depict their spatial knowledge in a scaled, geo-referenced manner and add a lot of precise details.

The fact that 3D models augment the power of mind and facilitate scaling, allows for filling in information more fully and accurately on a given area. Generally this is not the case with sketch mapping, which has been widely used to represent spatial knowledge in the context of participatory action research. The difference between a blank contour map and the corresponding relief model is the physical vertical dimension that provides essential cues for stimulating memory, establishing spatial associations and depicting cognitive maps (Rambaldi et al., *2002*).

LESSONS LEARNED

By carefully documenting and analysing over 20 cases where P3DM has been applied in developing countries (Tan-Kim-Yong, 1992; SM-HDP, 1998; Srimongkontip, 2000; Rambaldi et al., 2000, 2002a, 2002b, 2003; Martin et al., 2001; Tran Trong Hieu et al., 2002; Hoare et al., 2002; Hampson et al., 2003; Hardcastle et al., 2004) practitioners and users noted the following advantages of P3DM.

Enhancing Learning Capacity and the Power of the Mind

3D models offer a more efficient spatial interpretation base by displaying the vertical dimension which provides additional cues to memory and facilitates mental spatial knowledge processing. By providing a bird's eye view, and by accommodating different layers of information[2], relief models contribute to widening the users' evaluative frame of reference on spatially defined issues, and thus stimulate active learning and analysis. In other words, scaled relief models help participants in understanding bio-physical and socio-economic dynamics going beyond their individual cognitive boundaries.

Fostering Self-Esteem and Social Cohesion among Marginalised Communities

Both process and output fuel self-esteem, raise local awareness of linked ecosystems and delineate intellectual ownership of the territory. Experience documented in the Philippines has shown that P3DM exercises conducted at the community level and as a response to local needs versus external threats have yielded positive effects in terms of community-cohesion and identity building, through the revival of local knowledge. "Old people share history with young people, passing on legends and religious beliefs, sacred rites and places so essential to conserving tradition" (Alcorn, 2000, pp. 1-2).

Bridging Communication Barriers by Offering a Shared Perspective and Visual Language

Different opinions are frequently based on different perspectives and the quality of the media used to communicate. When a process is geared towards addressing conflicts bound to the territory, appropriate communication channels are essential to grant all parties equal access to information in order to develop a common understanding of the issues at stake. Case in point is the so-called *bird's eye view* offered by a scaled relief model through which a viewer acquires a holistic view of the landscape wherein landmarks and salient features are equally visible to everyone. In addition, when language barriers represent a constraint, information exchange best occurs via visual communication means based on colour, shape and texture, like in a 3D model.

Filling the Data Gap According to Users Perspectives

In developing countries baseline data available from official sources are frequently limited, inconsistent, outdated, scarce and/or inaccurate. Local geo-referenced knowledge is very valuable in such environments. If P3DM is applied in a genuinely participatory manner, it generates relatively accurate qualitative and quantitative geo-referenced data that are intellectually owned and understood by those who have compiled them (Chambers, 2002).

Scaling the Territory to Bridge Isolation

By miniaturising (1:5,000 – 1:20,000) real world features as known and perceived by participants, the method has proved to be particularly effective in dealing with relatively large and remote areas, and overcoming logistical and practical constraints to public participation in land/resource use planning and management.

Dealing with Boundary Conflicts

Resource use, control and access are increasingly the issues at stake in latent or explicit conflicts. P3DM has been successfully used in the Philippines (Rambaldi et al., 2002b) and Thailand (Srimongkontip, 2000) to deal with such controversies. By creating shared vantage points and offering a common visual vocabulary, 3D models and derived maps are instrumental in bridging communication barriers, facilitating dialogue and limiting subjective interpretations, thus setting the basis for fruitful negotiations.

Surfacing "Submerged" Knowledge

The possibility of using 3D modelling for mapping out water bodies deserves special mention, due to the partially hidden nature of these environments and the value of human cognition in its description and depiction.

Mapping out wetlands and coastal areas characterised by shallow waters is difficult, because of their instability and frequent change (e.g., river deltas). Nonetheless, in cases where the topography has been stable for a long period and reliable contour and bathymetric lines are available, the production of a participatory 3D model leads to generating an extremely rich

Figure 2. El Nido-Taytay managed resource protected area, Palawan, Philippines (1999)

information base on existing ecosystems and their inter-action with wetland-dependent communities.

The reproduction of the seabed also depends on the availability of bathymetric lines. Exercises carried out in the Philippines (Figure 2) have demonstrated how well fishermen could map out the details of their fishing grounds including the detailed description of coastal and marine ecosystems (Rambaldi et al., 2002).

Inherent Risks and Mitigating Measures

Because of their accuracy, relief models may have also negative implications. Alone or combined with GIS, "they turn local knowledge into public knowledge and conceivably out of local control. This can be used by outsiders to locate resources and meet development needs, or merely, to extract more resources, or increase outside control" (Abbot et al., 1999). Researchers, planners and practitioners should be aware of these possible drawbacks and be careful applying the method.

Being on a map, on one hand, means to exist vis-à-vis the external world, thus to be in the position to get or claim services and assistance. On the other hand, for communities wanting to maintain their cultural identity and traditions, it may carry undesired development pressures. From a biodiversity conservation perspective, depicting habitats of endangered species, or rare resources in demand on the black market, may lead to their further depletion (Rambaldi et al., 2002).

Therefore, exercises dealing with sensitive issues should be carried out with caution and behind closed doors in the course of focus group discussions.

Data at risk of abuse or culturally sensitive, should be removed from the model and eventually stored as confidential GIS layers with limited or protected access (Harmsworth, 1998).

CONCLUSION

The most important lesson learned with respect to the analysis done, is that the use to which the P3DM outputs can be put definitely depends on their integration with appropriate geographic information technologies and systems, and on the existence of an enabling regulatory environment.

As part of a widespread capacity-building effort involving institutional and customary custodians of natural resources, P3DM has been gaining increasing recognition as an efficient method to facilitate learning, analysis and proactive community involvement in dealing with spatial issues related to the territory. If properly administered, P3DM can support collaborative natural resource management initiatives and transcend the local contexts by establishing a peer-to-peer dialogue among communities and central institutions, agencies and projects.

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NOTE

Additional information on Participatory 3D Modelling is found at www.iapad.org. Pictures in the text courtesy by Giacomo Rambaldi.

KEY TERMS

Cognitive Maps: Internal representations of the world and its spatial properties stored in memory (also called mental maps).

Geo-Reference: The relationship between page-coordinates on a planar map and known, real-world co-ordinates.

Geographic Information Systems (GIS): An organized collection of computer hardware, software, data, and personnel designed to capture, store and update, manipulate, analyze and display geographically referenced information.

Participatory 3D Modelling (P3DM): A participatory mapping method based on the merger of traditional spatial information (elevation contours) and peoples' spatial knowledge (cognitive maps), the output of which are solid terrain models and derived maps. The models are used in development and natural resource management contexts and have proved to be user-friendly and relatively accurate data storage and analysis devices and at the same time excellent communication media.

Participatory Learning and Action (PLA): Umbrella term for a wide range of similar approaches and methodologies to involve communities in self-help and development projects. The common theme to all of these approaches is the full participation of people in the processes of learning about their needs and opportunities and the action required to address them.

Public Participation GIS (PPGIS): A spontaneous merger of participatory development methods with geo-spatial technologies (P-mapping, P3DM, GIS, GPS and remote sensing). PPGIS is usually geared towards community empowerment through measured, demand-driven and user-friendly applications of geographic information technologies and systems. PPGIS is an integrated practice which has multiple dimensions, builds on diverse tools, and highlights the integration of outsider with socially differentiated local knowledge, and builds essentially on high levels of participation at all stages of project implementation.

ENDNOTES

[1] Participatory Rural Appraisal, currently known as Participatory Learning and Action (PLA).

[2] Thanks to the variety of coding means (paint, yarns and pins), a 3D model can accommodate overlapping layers of information like, for example, "land use" and "land tenure" depicted by colour-coded paints and yarns respectively.

Pedal Powered Wireless Internet in the Laotion Jungle

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INTRODUCTION

A chance meeting with Jhai foundation founder, Lee Thorn, over breakfast during the 2003 "UN World Summit on the Information Society" in Geneva has led to the author becoming very interested in an exciting, innovative project currently being trailed in Laos. This project aims to bring wireless Internet connectivity to remote villages that lack access to electricity and other services generally regarded as prerequisites for entering the digital age. The project is based on cooperative development with local people to produce and develop a system based on a rugged, long lasting, and weather-proof Linux-based computer connected to the Internet via antenna, a repeater station and a link through an ISP located in the nearest large centre. This article will outline the technical features of the project, the advantages currently arising from the project, and an overview of the personnel currently involved and their roles in the project. This will be followed by a discussion of broader and diverse issues associated with bringing new technologies to people living in isolated and poverty affected areas like Laos. These include *ethical* issues around perceived cultural imperialism, prioritised allocation of resources, unequal access and effects of globalisation. Issues of a more *practical* nature also arise with respect to sustainability, advantages and disadvantages, and future directions.

BACKGROUND INFORMATION

Laos, a country in South-eastern Asia is northeast of Thailand and west of Vietnam and has a population of approximately 6 million people. Lao is the official language and other languages spoken include French, English and various ethnic languages. It is a country with a very poorly developed infrastructure. For example, it has no rail system and an elementary and poorly maintained road system. Telecommunication systems offer little external or internal access and electricity is restricted to a few areas with higher population densities. A large percentage of the population (80%) is engaged in subsistence farming. The project discussed in this article is taking place in the Hin Heup district of the Vientiane province which is approximately 100 km from the capital Vientiane. The nearest markets are situated in Phong Hong which is approximately 30 km away. Facilities for transport are scarce and torrential rain in the wet season makes the roads almost impassable.

TECHNICAL FEATURES OF THE PROJECT

Lee Felsenstein, developer of the Osbourne computer and pioneer in the development of publicly available microcomputers, designed a compact, rugged computer with the power of a pre-Pentium machine specifically for the Jhai Foundation project. The machine has no moving parts, is small and compact, and has a waterproof case designed to counter the onslaught of the South-East Asian monsoon season. The main processor is a 486-type chip, which allows the use of a heat sink rather than a fan, thereby eliminating the common problem of fans seizing up in adverse conditions. More powerful processors, like recent Pentiums and AMD chips, require large fans. The Apple G5 requires multiple fans as well as a liquid cooling system. These are all potential problem sources in harsh conditions. Importantly, whereas a standard desktop computer requires 90 watts of power, the project machine draws only 12 watts. The machine uses a small energy saving LCD screen, and flash memory chips have replaced a conventional hard disk drive. Finally, the machine has been designed to withstand formidable conditions of different kinds for a minimum of 10 years with little or no maintenance. These conditions include torrential rain, choking dust, and intense heat and humidity at different times of the year. The machine will ultimately be capable of mass-production for less than $400 U.S. dollars per unit.

On the basis of an initial investigation solar power was rejected as a means of powering the unit, due to the cost involved as well as the adverse cloudy and gloomy conditions during the wet season. Pedal power subsequently proved to be a very sustainable method of providing power, and at just one-third the cost of solar energy. A prototype pedal generator linked to a standard automotive battery produces five minutes of computer use from each minute of pedalling.

Wireless connectivity is provided by a standard 802.11b card linked to an antenna located on the thatched roof of the bamboo structure in the Phon Kham trial site. This is in turn linked—via a solar powered repeater station in the hills—to a local Internet Service Provider (ISP) in a larger centre. The system relies on standard and relatively inexpensive wireless hardware components.

Perhaps the most interesting component in the overall system is the locally adapted Linux operating system and software for word processing and simple spread sheet applications. Dravis (2003) describes the system as a local version of KDE, known as LaoNux on the Debian Linux distribution. Technical work on this component of the project was conducted by Anousak Souphavank—a former IBM programmer now working at the National University of Vientiane—with students and lecturers who provided voluntary assistance. This complex technical challenge involved creating a custom Unicode to support the Laotian font set. The result is a stable version of Linux using the local Laotian language.

Crucial software components include a Web browser for navigating the Internet, a local language version of an open-source word processor and spreadsheet package, and a Voice over IP (VoIP) system that makes local and international telephony possible through the standard phone system. These software applications meet the needs and uses of the system expressed by local people. Thorn (2002) identifies some of the planned uses. According to Thorn:

...right now, the villagers have no way of telling what the market is in the big towns they sell their stuff to, telling what the weather report is for their crops, things like that. This will absolutely change that. Plus, they will be able to talk to relatives in America some of them they haven't seen in decades. (n.p.)

These hopes for utilising the system have been realised in the trial village. Plans are currently underway to extend the program to four other Laotian villages and to sites in up to six other countries.

ISSUES

Some researchers in the field of ethics and ICT development caution against wholesale acceptance and adoption of modern technologies by tribal communities in developing countries. Efforts to diffuse modern technologies within such settings have, not infrequently, been denounced as exercises in cultural imperialism. Demmers & O'Neil (2001, 40) argue that:

...whether you agree that access to technology in developing nations is detrimental to the mainstream of their cultural heritage, the reality in the world today is that a predominantly Western approach to the use of technology is subverting these cultures at an accelerating rate. A new form of cultural imperialism is emerging as tribal communities become wired to the Internet, gain access to satellite television, and begin using global positioning systems to enhance agricultural productivity.

Demmers and O'Neil claim that training people in tribal cultures to add their own content to the Web would only reduce the impact of ICT, not overcome it.

Contrasting views maintain that access to new information communication technologies is a pre-condition for development in the modern world. According to a statement on the Web site of a second project, (LINCOS), that also provides a form of mobile ICT devices to people in isolated areas:

...a techno-centric view has proven not to meet the actual needs of the communities. In fact there is a need to enrich the vision with appropriate, creative and intelligent methodologies for the use of technologies to enhance sustainable developed rural communities. (n.p.)

Rather than dismissing outright the provision of ICT as cultural imperialism, the LINCOS view argues that simply providing technical solutions in a techno-centric way may be counterproductive. Instead, creative solutions must be pursued. The approach taken in the Jhai Foundation initiative reflects the pursuit of appropriate, creative and intelligent solutions advocated by the LINCOS team. This is evident in the close collaboration between Americans like Lee Thorn and local programmers like Anousak Souphavanh that has resulted in joint development reflecting the local language and locally expressed needs.

Many of the concerns expressed in oppositional views involve the exposure of local people to mass media via the Web. This, however, is unlikely to occur in the short term through the Jhai Foundation project. Few people in the villages speak English, and they will be using software and Internet sites written in the local language by local people. Some English speakers will, of course, be needed to interpret English language sites that provide useful information on weather and up-to-date agricultural practices. The fact that this initiative does not comprise a narrowly techno-centric approach is further evident in the link between the technology and efforts to improve agricultural practices ways that are environmentally friendly and economically advantageous. The Jhai project team helped villagers acquire organic farming techniques and helped them obtain organic certification and learn how to

determine appropriate markets for selling. The technology provides excellent information on organic farming techniques, crucial weather information, and current market prices in the cities. This enables the village to maximise economic returns on their products.

A common critique of ICT projects in developing nations has been that other priorities are more pressing. According to Blake and Standish (2000, 47), for example, remote societies:

...are in danger of exclusion from global development, although not immune from the effects of globalisation. But access to ICT brings new forms of exclusion and new risks. It also makes stern demands on distributive justice, for any money spent on developing ICT and its necessary systems of support will be money not spent on food, shelter, health care and basic education.

Olsen (2002) argues that developing countries should be very cautious about investing in ICT when basic needs are not being met. Such arguments are certainly valid in light of some large-scale techno-centric projects that have turned out to be "white-elephants." Akubue (2000) writes that "third world development … requires both large- and small-scale appropriate technology." He claims that many large-scale projects that have involved "transplanting" advanced technology and infrastructure have had major shortcomings and brought detrimental effects. These include influxes of people to cities, loss of culture, and adverse environmental effects. Akubue insists that different approaches are needed, especially for rural and remote areas.

Tipton (2002) observes that international agencies and governments tend to be overenthusiastic about large-scale ICT projects. They are inclined to overemphasise benefits and underestimate problems associated with them, mistakenly concluding that such projects provide quick fixes to problems. Small, well thought-out projects, like the Jhai Project, contrast with the failures of some over-ambitious larger scale efforts. In relation to other small-scale ICT developments Dertouzous (2001, 20) claims that, "if even a small number of Nepalese or a few inner city people found a way to become interconnected, they would serve as a role model for their peers." Dertouzous argues that small projects can often have profound effects out of proportion to their size. The potential for far reaching effects can already be seen in the development of the Jhai project. Even though the project has many obvious merits, some critics would still deem this project to be cultural imperialism in "kid gloves." achieved through "user friendly means" by maximising economic returns on crops and produce by selling at the best prices to remote markets. This in turn may lead to the development of a Western model of profit maximisation within exchange relations as opposed to a more subsistence model. It is not within the compass of the present article to pronounce on such issues that are deep and intractable. What *can* be said of the Jhai initiative is that the project enables local people to realise more fully, purposes and goals they are *already* engaged in and committed to, by means that are collaborative, environmentally friendly and locally driven.

Sustainability—in the sense defined in the United Nations Report "Our Common Future" (see Nieto, Neotropica and Durbin, 1995) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"— is a further important consideration here. Many people working in the field of ICT development in countries affected by poverty could attest to the relics of one-off funded projects that remain as monuments to stupidity once the funds dry up. Managers of the Jhai project have considered sustainability by linking the technology to economic benefit in the form of enhanced agricultural practices, better market prices for crops and woven textile products and improved education. Initial costs have been offset by funds provided by external humanitarian agencies and ongoing costs have been reduced by the robustness and long-term durability of the hardware. Local community ownership of the project has been attained through genuine collaboration within the project, and a low-cost user pays structure has been introduced to offset costs associated with linking to the distant ISP.

The issue of sustainability is related to earlier arguments about prioritising expenditure under conditions where economic disadvantage means that communities often lack basic needs. While it may seem "logical" to use scarce funds solely for food and medical needs, this approach can actually foment deeper forms of dependency rather than contribute means for self-sufficiency. A second strategy that pertains here is over-protection through government subsidy. O'Meara, Mehlinger, and Krain (2000, 348) argue here that:

...while the gap between the rich and the poor in today's world is disturbing, those who have argued that this gap is unjust supported heavy-handed state interventionism and a retreat from open competition, which preserved indigenous production in the short term but rendered it less efficient against those stimulated by market forces.

In some circumstances direct aid in the form of food or protectionism may be necessary, simply to prevent catastrophes. On the other hand, projects like the Jhai Foundation initiative offer continuous benefits and local control.

In a small yet compelling way, the Jhai Project and its potential expansion can help ameliorate the effects of

globalisation and the resultant need of all communities to come to grips with modern information communication technologies. The present world situation is such that imbalances in access to crucial tools like ICT are so extreme that they account for some of the current international discontent. O'Meara, Mehlinger, and Krain (2000: 348) further maintain that:

...the developed economies appear to have all the trump cards in their hand—capital, technology, control of communications, surplus foodstuffs, powerful multinational companies—and, if anything, their advantages are growing because technology is eroding the value of labour and materials, the chief assets of developing countries.

Dertouzous (2001, 20) argues in accordance with this view that the rich,

...who can afford to buy the new technologies will use them to become increasingly more productive and therefore even richer. The poor will be left standing still. The outcome is inescapable—left to its own devices, the information revolution will increase the gap between rich and poor nations and between the rich and the poor between nations.

Projects of the kind being implemented by Lee Thorn and others through the Jhai Foundation are designed to help prevent currently disadvantaged communities from falling further behind. They strive to do this by pursuing workable, intelligent and creative solutions developed within cooperative partnerships and in appropriate ways, and that should prove to be sustainable.

FUTURE DIRECTIONS

The Jhai Foundation Project has received attention from many large humanitarian agencies. Early success has led to thoughts of possibly mass producing the basic components that would then be further adapted to meet the cultural demands and local needs of countries like Indonesia, Cambodia, Bangladesh and Southern China. It was the first project to link a truly remote community via human powered, wireless WAN (Wide Area Network). A second project, LINCOS, has worked on a portable method of connecting less remote communities via a modified standard shipping container harnessed to mains power or a generator that provides Internet access through a satellite link.

Sheats (2000, 41) outlines the LINCOS model for the building infrastructure as follows:

[Physically], the fundamental basis of the LINCOS digital town centre is a standard ISO shipping container (2.4x2.4x6.1 m) remodelled and equipped with a set of IT and wireless communication equipment. It is Internet-linked via satellite, with standalone power source and measurement capabilities for medical and analytical applications.

This LINCOS project, based in Costa Rica, has been in operation longer than the Jhai Foundation initiative, and offers some features that could be taken up by the Jhai Project. For example, the LINCOS model uses low-cost probes and testing equipment to measure important soil characteristics. These measurements are sent via the Web to distant scientific laboratories that provide advice on deficiencies in the soil or requirements of particular crops. In the case of the organic production approach used by the Laotians, this would mean adding organic phosphorous, nitrogen, or whatever other nutrients were required to ensure higher crop productivity or quality. Another interesting application is the training of a health monitor who uses the Internet, software and basic instruments to provide health care and preventative advice. LINCOS, however, uses Microsoft Windows operating systems and software. It is a considerably more expensive option and possibly not suited to the types of locations potentially served by the Jhai model. Some of the same community uses could, however, be supported.

The LINCOS model has developed methods of using ICT for educational purposes. It has adopted principles outlined by Seymour Papert for applying constructivist learning principles in practice. Papert has had direct involvement in the project through LINCOS's partnership with MIT. In Papert's model students use the technology to solve genuine community problems, such as building bridges and roads, using word processors to record project proposals, spreadsheets to facilitate genuine budgets and various other ways of solving social problems. They also take control of the machines by engaging in basic programming, using Logo, and even engage in linking computers to other devices like simple robots.

Interestingly, perhaps, neither project has drawn on the potential of speech recognition software to enable semi-literate or illiterate people to access the Internet, or various other useful applications like word processing. Dertouzous (2001) points out that speech recognition software can assist people who speak languages that aren't currently accommodated by available keyboards or to overcome problems of illiteracy or semi-literacy. He cites experimental work at MIT to support the argument that speech recognition software works as effectively when applied to more complex languages like Mandarin as it does with English. Dertouzous (2000, 37) argues that,

"speech technologies could help people anywhere in the world who cannot read or write, but who could still have productive exchanges on the Web in their native language."

In both models the value of using the Internet for e-commerce is being explored, opening the possibility to marketing unique products at prices that would add considerably to the village economy. In the Laotian villages the unique and beautiful hand-woven textile products would be an example of highly marketable products. In other areas of the world this has already been successful, as with the distinctive artworks produced in the remote Torres Strait Islands (north of Australia), which are successfully marketed on the Web.

CONCLUSION

The Jhai Project embodies a number of desirable qualities, including sustainability, longevity, practicality, and a spirit of close and respectful collaboration. Its intelligent and creative implementation alleviates many of the fears of cultural imperialism associated with large scale technocentric models that often end in spectacular failure. In the short term, Laotian villagers have been able to gain organic certification. Using market monitoring through the Internet in conjunction with their organic approach, they have been able to obtain higher prices for their better quality products. They have been able to talk to friends and relatives who have migrated to distant local or international locations and to increase their knowledge of Internet services such as access to information. Many people are beginning to develop their skills in computer applications by using a free, open-source operating system, a word processor and a spreadsheet in their native language. Apart from these early uses that meet community needs, many more opportunities are possible in the future. These include e-commerce, control via speech recognition and increased educational and business opportunities. The Jhai Foundation model has the potential to be more economical through mass production and adoption by other countries and it involves the combined, voluntary efforts of many people across several cultures. It stands out as being a humanitarian rather than commercial success for the developers, since the economic and social benefits remain with the villagers.

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KEY TERMS

Cultural Imperialism: Activities that subvert the local culture in ways that change or subsume the culture and cause it to become more like the dominant culture.

Jhai Foundation: The Jhai Foundation is a non-profit organisation founded by American, Lee Thorn. The foundation is managed by an advisory board and includes many volunteers as well as paid contractors. Its aim is to assist the people of Laos in a collaborative manner in the areas of economic development, education and information technology.

Laos: A country in South-eastern Asia is northeast of Thailand and west of Vietnam.

LINCOS Project: The title stands for Little Intelligent Communities. This project is an initiative of the Costa Rica Foundation for Sustainable Development and is aimed at promoting sustainable development through the provision of Information Communication Technology training.

Speech Recognition Software: Software that converts spoken language to text within a word processor.

Subsistence Farming: Growing food for survival rather than creating a marketable surplus.

Sustainability: The definition used in the article was sourced from United Nations Report, "Our Common Future" (i.e., "development that meets the needs of the present without compromising the ability of future generations to meet their own needs").

Voice Over IP (VoIP): A system that makes local and international telephony possible through an Internet link.

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Planning for Electronic Government in a Remote Malaysian Site

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INTRODUCTION

A regional government IT master plan sets out a viable path for the use of information technology (IT) to support local government operations, align local IT use to national initiatives, and build the organizational capacity necessary to take maximum advantage of the future emergence of more advanced tools. It guides IT deployment in three domains:

1. Within and among the various agencies of the local government
2. Among these agencies and organizations in the private sector
3. Among these agencies and members of the general public

This article, based on a synthesis of the theories of service quality and strategic planning, lays out a basic structure, process, and content for a strategic IT plan, and provides a planning template that serves as a starting point for jurisdictions in a remote context.

Like any tool, the planning process must fit its context. This includes its geographic, political, social, and economic environment, the organizational structure, and its scale, scope, culture, policies, core technology, and access to IT and other resources. The scope for IT planning includes selecting computing and communications hardware and software, structuring and staffing IT service delivery, specifying IT-based applications and data resources serving the host agency, and designing products or services based on information delivered via IT infrastructure.

The case site is a state government in Malaysia. One of 13 states, Sabah occupies 76,000 square kilometers on the island of Borneo, 600 kilometers east of Peninsular Malaysia. A population of 2.5 million embraces over 30 different races speaking over 80 different dialects. Primary commodities such as agriculture, forestry, mining, and petroleum dominate the export-oriented economy. Emerging industries include manufacturing and tourism. Roads, electricity, and telephone networks are less well developed than in Malaysia's peninsular states (UN, 2002), reflecting the tendency for development projects to ben-

efit large cities and regions near capitals, rather than remote regions (Sorensen, 1997).

The context is interesting due to its remoteness, widely dispersed population, interest among public leaders in IT-based solutions, and emerging national policies that may support and enhance local efforts. As many of its lessons apply to other remote locations, the purpose of this case is to illuminate the strategic interactions among local goals, the local agency context, and its external environment.

BACKGROUND: THE STRATEGIC CONTEXT FOR IT PLANNING

Strategic IT direction is realized through the pragmatic and concrete acquisition and deployment of resources that will support the vision expressed by leaders. These decisions and actions emerge from an analysis of the vision in the context of an intensive environmental scan *to identify external opportunities and threats resulting from changes in the environment* and a realistic internal scrutiny *to identify potential strengths and weaknesses*.

Shifting Environmental Forces

The environmental scan diagnoses the future impact of structural forces on the organization (Hax & Maljuf, 1984). For local government, the significant environmental forces stem from shifts in the global economy, introduction of new technology, and rapid development of the nation and of its people. Technological trends include the following:

1. Broad adoption of cross-platform browsers and platform-independent languages that create common interfaces
2. Emergence of low-cost digital network access "appliances" for use in small offices and homes
3. Rapid increases in bandwidth from investments in fixed and wireless networks, combined with improved efficiency through data compression and other technological advances
4. Improved data management tools, such as data warehousing

Alignment to National Policy

The Malaysian government embarked on a policy to bring its people into the ranks of the developed world by the year 2020. Within this broad initiative, it formulated a Multimedia Super Corridor (MSC), to support former Prime Minister Mahathir's vision of an information-rich society. This demands the development and use of IT, plus an acculturation process to enable citizen participation in the shift to a knowledge-based society:

Information-Rich Society: one which thrives and grows in all its activities through the ready and dynamic utilization of information, brought about by its active appreciation, acquisition, assimilation, application, and transmission. (Former Malaysian Prime Minister, Dr. Mahathir bin Mohamad)

The Multimedia Super Corridor (MSC) project involved attracting and nurturing a cluster of enterprises to peninsular Malaysia, and flagship applications including electronic government. This was an opportunity to link local efforts to the larger, deeper MSC plan, which hoped to (Han, 1996):

• Offer efficient, high-quality administrative services to citizens and businesses
• Streamline internal government processes to improve service quality and lower costs
• Strengthen data security while protecting privacy
• Strengthen democracy

The government mandated that ministries (including the Prime Minister's office) operate electronically, which required formulating and enacting new legislation to protect security and privacy and establishing government-wide standards to allow cross-ministry use of selected mission-critical infrastructure components and databases.

What governments do forms a context for what IT can do for government. Today's government institutions were designed to support a rapidly industrializing society that is disappearing. In Alvin Toffler's view, customization replaces standardization; complexity with its holistic view replaces the specialization practice of breaking down tasks into component parts; just-in-time production replaces synchronization; flat organization charts replaces hierarchy; and decentralization replaces centralization. IT is the enabling technology for all these strategic shifts (Toffler, 1980).

THE FUTURE OF ELECTRONIC GOVERNMENT IN REMOTE AREAS

The key policy objectives were to improve public service levels and create an environment that attracts investment, which would then create new and better jobs for residents and generate wealth. The viability issues were (1) rapid introduction of relevant new technologies, (2) availability of specific skills and interests in using this technology, (3) recent emergence of a small but active local market for technology (which supports local vendors and attracts overseas technology sources), and (4) potential availability of a vast amount of useful content. The plan outlined below was developed by state government planners, supported by consultants with IT management experience (ITMP, 1997).

Strengths

Over the near term, the primary strengths of the agency were leadership who strongly support the strategic goals of administrative renewal and bringing the government closer to its citizens; access to the necessary financial resources; and key "islands of competence" in various disciplines (such as a strong state library system, deep knowledge of institutional systems, and recent local initiatives in electronic publishing) that were critical to successful deployment of the new media.

Weaknesses

For the Sabah case, these were an inadequate public and local government telecommunications network infrastructure; information technology architecture too weak to enable the necessary level of connectivity and data sharing; lack of data administration; scarcity of skilled manpower resources, both technical and managerial, needed to build, operate, and manage a state-of-the-art IT infrastructure and the electronically enabled business processes that will enable direct delivery of government services; and very little service quality management experience.

Opportunities

The falling cost of IT and telecommunications would speed diffusion. Television, print, and radio share the basic characteristics of broadcast media. Messages are one-way, distributed indiscriminately to a wide audience.

In contrast, the Internet is a two-way communication medium. On the Internet, a Web site provides a direct two-way link to its particular constituency, supporting communities with interests as diverse as stamp collecting, health, or retail branding.

Most *threats* to the proposed strategy were internal in nature, linked to the need for early systems to produce visible benefits. The primary hazards included a lack of sound technology management, poor top management support leading to inadequate funding, poor security leading to low public confidence, and lapses in service quality management.

Strategy

Six "BUILDS" elements embrace the major initiatives for action, as discussed below:

1. Balance technology, organization, investments
    *   Legacy systems
    *   New media
    *   Computing
    *   Communications
    *   Content

The current situation is imbalanced: while computing resources are in place, there is no integrated network or adequate tools and policies for information dissemination. Similarly, although computing is managed on both a centralized and decentralized basis, its management is not integrated. Most seriously, content is not managed as a public resource.

2. Utilize the network as the basis for strategic linkages
    *   Within local agencies
    *   Within the nation
    *   Within ASEAN

The MSC project involves attracting and nurturing a cluster of enterprises to peninsular Malaysia, which will develop several flagship applications, including: telemedicine, smart schools, multimedia funds haven, multimedia research and development cluster, electronic government, worldwide manufacturing Web, and borderless marketing center.

3. Invest in IT manpower
    *   Overseas education in emerging technologies and IT management
    *   Seminars to inform and motivate the general public
    *   Workshops for management
    *   Training for empowered end users

Intelligent communities must be able to "maintain and improve standards in the learning of basic communication and numerate skills by children, their business corporations will be committed to the intellectual development of their employees and, above all, they will create large subcultures which work at the creation of an advanced infrastructure with such energy that their enthusiasm spreads to their fellow citizens" (Wriston, 1998).

4. Leverage available resources: public and private
    *   Internal
    *   Local vendors
    *   Overseas IT suppliers
    *   National telecoms operators
    *   Regional universities and schools
    *   Service industries

Around 1980, Singapore shifted to a skill-based economic strategy to attract investment from higher value-added industries. Through a combination of overseas education, local training, and immigration, the government rapidly expanded its IT manpower pool.

5. Deploy a broad range of IT-based solutions and adapt processes

Integrating the new media is largely a function of architecture, and virtually every information technology has a potential role in the plan. Point-of-sale (POS) technology is an example of a solution that may transfer from the private sector into local government operations.

6. Structure supply–demand relationships over time

Public-sector data resources around four main hubs: finance, people, enterprise, and natural resources.

*   **Financial:** Effective management of a government budget and cash flow requires an understanding of interactions among various internal and external factors, and an online financial model, linked to external databases and internal financial and treasury systems, would support financial operations.
*   **People:** While its people are the heart of local government, many interactions (especially health, education, and public safety) lie in the federal domain. For local government, manpower development is the focus.
*   **Enterprises:** If business is the vehicle to carry the government economy forward, then enterprises (and especially those that are now small to

medium size) represent its engine. Government can use IT to nurture local enterprise, help them establish links with overseas suppliers and clients, and as a source of specialized services and skills.

- **Natural Resource:** Local government's geographic diversity is an obvious strategic resource, and agencies can improve process management using geographic information. Today's network-based geographic information systems (GISs) offer large benefits at low marginal costs once initial geocoding is in place.

THE "BUILDS" ACTION PLAN

The six strategies listed above represent the major initiatives for action. As harmony can follow only when each individual action program conforms to all six initiatives, each of the action programs listed below should be interpreted in the context of the entire set of six "BUILDS" initiatives. The vision is to achieve administrative renewal and bring the government closer to its citizens through a fully electronic government by the year 2002. "BUILDS" can be deployed in four discrete stages, each of which provide immediate value and prepare the way for the next.

As Figure 1 indicates, each stage requires advances, both in the completeness of the strategic vision, and toward managing the complexity of its underlying technology.

The initiation stage builds on current infrastructure and capability. This stage should be accelerated as much

Figure 1. Stages in "BUILDS" deployment

as possible and should focus on providing the highly visible value of connectivity and access to public information, meanwhile acquiring the experience and establishing the technical standards necessary to move on to Stage II. From an external perspective, the local government net raises public awareness and builds support for the project. Widely used technologies such as e-mail, facsimile access to forms, and short-messaging service (SMS) can enhance the public image of IT-based services at relatively low cost. A complete catalog of public information defines the inventory that might eventually be provided to the public over the network and enables policy makers to formulate information dissemination policies. The acquisition and integration of a third-party search engine to deliver available public data is a highly visible step toward fulfilling the early promise of electronic government.

From an administrative renewal perspective, providing government-wide e-mail links among offices can improve internal workflows, while radio paging, SMS, and voicemail will improve both coordination among field workers and service responsiveness. During this stage, it will be necessary to define standards for electronic distribution of reports, forms, procedures, and other internal documents, as well as the standards for electronic publishing, including procedures and guidelines for managing access to all public information through electronic media. This stage builds up the organizational and technological capacities necessary to overcome the barriers to electronic government identified earlier.

By enabling public access to GIS information, this stage of "BUILDS" visibly reinforces the promise of an open information access policy. In placing government job opportunities online, the strategy creates a more efficient labor market and supports the industrial masterplan. During this stage, the government must take its initial steps toward the strategic applications that will lead the way toward electronic government. An electronic community's pilot can use Sabah.net to weave a rich social fabric to bind its citizens more closely. An electronic tendering prototype, tested with local IT vendors, is a low-risk move toward electronic commerce.

A government-wide data administration initiative is a critical step toward managing its data resources as a corporate asset and is a prerequisite to providing the online extracts of public information needed for effective transaction processing in later stages. Underlying each of the above activities and tasks is the development of government-wide network management capabilities, and the design of an information and network architecture to provide high connectivity and reliability at an affordable cost.

During Stage III, the government can exploit the results of the initiatives from earlier stages, for example, by
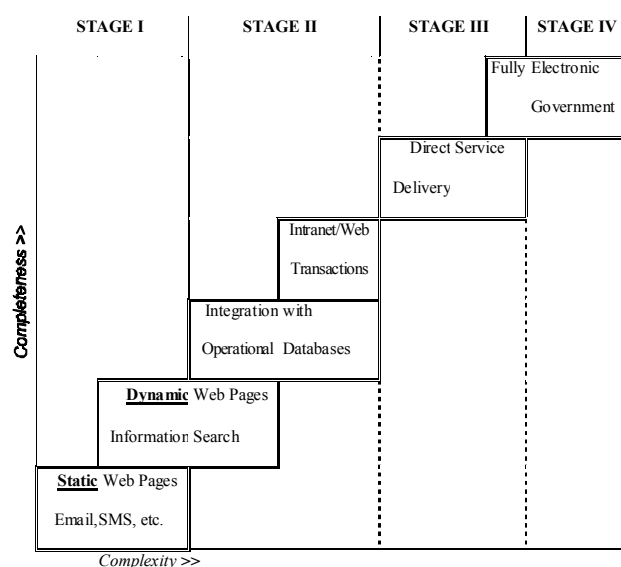
rolling out the advanced multimedia facsimile technology to add value to the fax-on-demand services to the more remote communities. Service quality management will be an important activity (Donnely, 1995). One useful approach is to identify gaps between citizen expectations and their actual experience (Ziethaml, 1990). However, many current methodologies fail to identify the contribution of infrastructure, necessary to manage service delivery over the network. By this time, a government will be ready to deploy its lifelong learning field trials, to complement the digital library prototype. But the primary focus will be internal. By providing multimedia links among key offices, data warehousing for all shared data, a government-wide voice and data network, global positioning system (GPS) tracking of mobile resources, and developing an information resource management policy, the government prepares for Stage IV.

IMPORTANT TRENDS

The strategic Stage IV "BUILDS" initiatives are large-scale, yet widely distributed applications with high social and economic impact that require extensive information processing and that can benefit from a strong underlying information infrastructure. These rest on the success of the earlier stages.

Digital Libraries

A network-accessible digital library is a knowledge center without walls, open 24 hours a day. Many of the management capabilities for a digital library are relevant to other agencies. The government must support basic and strategic digital libraries and the acquisition and demonstration of digital publishing technologies, which can later be deployed by other "BUILDS" applications:

- Technologies for automatically capturing data in all formats (text, images, speech, sound, etc.), generating descriptive information about such data in a variety of formats.
- Advanced algorithms and intelligent interactive Internet-based tools for creating and managing distributed multimedia databases and for browsing, navigating, searching, filtering, retrieving, combining, integrating, displaying, visualizing, and analyzing very large amounts of information in inherently different formats. (These databases are frequently stored on different media that are distributed among heterogeneous systems across government agencies and around the world.)

Electronic Communities

A small and extraordinarily diverse citizenry populates a large land area. To end their isolation from today's age of global information, the government can provide Internet access to the general population through public libraries, and foster a strong sense of community by:

- Creating online environments to foster the free exchange of ideas and knowledge about work, play, and other communities of interest, such as gardening, sailing, computer games, or the environment.
- Creating online environments that support communities of relationship, for example, in childbirth, aging, and other life experiences that can be shared with others.
- Creating channels for feedback from citizens to their government.
- Crisis and emergency management: large-scale, time-critical, resource-limited tasks such as disaster management.

Lifelong Learning

The government positions IT as a resource to enrich and accelerate education, training, and learning systems for people of all ages and abilities. The "BUILDS" framework approaches this challenge from several directions:

- Distance learning provides timely access to specialized resources for geographically widespread students.
- Teacher training leverages the resources available to adult education programs.
- Students have more equal access to information and data resources now only available at libraries.
- Lifelong learning provides educational opportunities to populations regardless of age or location.
- Digital libraries deliver information throughout the network—to professionals as well as students at all levels.

The strategy rests on two pillars: universal network access and scalable pilot projects to publicly demonstrate the value of information technologies for improving learning and training outcomes.

CONCLUSION

With acceptance by the Sabah IT Council of the ITMP, the Science and Technology Unit of the Chief Minister's Department was appointed as System Administrator of

Electronic Government Systems and Sabah.net, a platform of independent information superhighway connecting state government, the business sector, and the general public. Wide-area network operations and technical training were outsourced to a local firm, the State Computer Services Department operated agency-internal IT infrastructure and administered technical standards. The State Library assumed responsibility for online publishing, and the eMAS virtual community Web site. Sabah.net is the backbone infrastructure that connects all the government ministries, departments, and statutory bodies to facilitate a gradual transformation of public-sector operations. While progress is generally consistent with the ITMP, there are some interesting surprises. Although state libraries play an important role in providing access, they are supplemented by cybercafes owned by young graduates below the age of 30, who finance operations from personal savings and family support (Alhabshi, 2004). Rather than wait for development to trickle down to them, Sabah (and Sarawak) implemented extensive state-level IT master plans. The resulting projects are more community oriented than national plans and emphasize bringing IT to the grassroots level (AITD, 1999).

The local ITMP leverages the national MSC project, which will gradually integrate communications, data management, and security services to enable the automatic exchange of business information among diverse organizations. To attract companies to participate in the MSC, the national government provides both financial and nonfinancial incentives. These include zero income tax for a period of 10 years, R&D grants, and a 100% investment tax allowance on new investment in the MSC. Nonfinancial incentives include unrestricted employment of foreign knowledge workers, no restrictions on global capital, and relaxed ownership restrictions. The MSC attained its goal of 500 certified companies in 2001, 2 years ahead of schedule, then more than doubled this number by mid-2004 (MSC, 2004). The majority of MSC companies were small to medium-sized enterprises, employing about 18,000 knowledge workers, of whom nearly 90% are Malaysian.

Government agencies collaborated with large enterprises to develop and apply technologies that enable electronic commerce, with an initial emphasis on industries that are strategic for its industrial development. However, this national strategy may shift with the retirement of Prime Minister Mahathir Mohamed. Officials close to new Prime Minister Abdullah Badawi say he will deemphasize costly, high-profile infrastructure projects and stress improved grassroots economics and human-resource development, especially agriculture and biotechnology. "I'm not into big projects," he says (Jakasankaran, 2003).

History shows that new technology drives change in other domains. Railroads extended the market reach of factories. The telephone network linked factories to markets. With electric lighting, factories extended their operating hours. These forces altered industry structure. Similarly, the technology trends outlined above will inevitably alter both the process and structure of government services. The critical success factors appear to be infrastructure, manpower, and partnership with industry. The basic telecommunications infrastructure plays a key role, supported by value-added networks, the national MSC project (even though this was delayed by the 1997 fiscal crisis), and local agencies and corporate allies. Teamwork among diverse organizations was key to the progress of the MSC to date and was critical to the visible success of Sabah's ITMP.

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KEY TERMS

EMAS: Community Web site operated by Sabah State Library.

GIS (Geographic Information Systems): Systems composed of computer hardware, software, geographic data, and personnel designed to capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.

Information Technology Master Plan (ITMP): Strategic document identifying links among goals, actions necessary to achieve them, resources, and constraints.

Malaysia: Southeast Asian nation with a population of 20 million.

MSC (Multimedia Super Corridor): Industrial development project in Malaysia focused on IT.

POS (Point-of-Sale): Commercial technology connecting remote transactions to a central database.

Sabah: One of 13 states in Malaysia, on the island of Borneo.

SMS (Short Messaging Service): Text messaging function in a mobile phone network.

Political Online Communities in Saudi Arabia

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INTRODUCTION: INTERNET IN SAUDI ARABIA

The Internet was introduced in Saudi Arabia in late January 1999 after a long period of discussions and consultations within the Saudi authorities. Finally, it was agreed that a tailored version would be made available to the public. To enable this, a huge filter system was set up in Riyadh in conjunction with an American company. The reason for having such a filter system was that the Saudi authorities had serious concerns about the arrival of undesirable material (for example, pornography) on home computer screens and also for other cultural, religious, and political reasons.

In 2003 there were 1.8 million Internet users in the country (Al-Watan, 2004), which is about 10% of the total population. According to a recent study, of this 1.8 million, 50.47% participate in online communities (JeddahNews.net, 2004). There are many types of online communities including social, religious, and medical. This article is concerned only with political online communities, which have become popular in the last three years as a result of the recent changes in the world following the September 11, 2001 attacks on the U.S. and the wars against Afghanistan and Iraq.

This article presents findings that describe POCs in Saudi Arabia, particularly their role as media tools and as facilitators of freedom of expression. After a brief examination of online communities in the literature, the article discusses the conceptual framework of the study and explains how data were collected and analysed. A discussion of the findings of the study is then presented.

ONLINE COMMUNITIES IN THE LITERATURE

While there are many accounts in the literature of what an online community is (see, for example, Kollock a&Smith, 1999; Wellman & Gulia, 1999; Jones & Kucker, 2001), for the purpose of this article an online community is defined as consisting of:

(1) People who interact socially as they strive to satisfy their own needs or perform special roles such as leading or moderating, (2) A shared purpose such as interest, need, information exchange or service that provides a reason for the community, (3) Policies in the form of tacit assumptions, rituals, protocols, rules and laws that guide people's interaction, (4) Computer systems to support and mediate social interaction and facilitate a sense of togetherness. (Preece, 2000, p.10)

The above definition shares most of the elements that can be found in an "off-line community," although the shared area in the case of an online community is a Web-based forum and the interaction is achieved through messages exchanged via computer screens. Additionally, Preece (2000) included in her definition the concepts of rituals, rules and policies which normally characterise "off-line communities" such as those in Saudi Arabia. This makes this definition appropriate for understating online communities in Saudi Arabia.

The online communities that are the focus of the present study are asynchronous online communities which are based on public discussion forums on the Web. Asynchronous communication means that the interaction among participants in these communities takes place in delayed time, that is, without everyone gathering at a particular time. Asynchronous communication also, unlike the synchronous type, eliminates the need for immediate feedback, which gives communicators more time for further thought and reflection (Mitchell, 1999). Web-based forums[1] are specific types of software that facilitate public discussions through the exchange of messages via computer networks (CSU, 2004). Forums on the web allow access to messages in the same way a Web page is accessed—by clicking a hyperlink.

The literature indicates that people online behave in ways that differ from their behaviour off-line. According to some Internet communication researchers, the degree of anonymity can cause people who communicate via computer screens to experience some reduction in the normal constraints on their behaviour (Joinson, 1998, p. 49). This reduction may hinder reflection about the consequences of actions, which in turn may lead to uninhib-

ited[2] behaviour. Additionally, public self-awareness, which is induced by situations in which an individual is aware of the possibility of being evaluated, is reduced as a result of interactions online and can also lead to uninhibited behaviour (Joinson, 1998, p. 51). Wallace (1999, p. 239) adds that people can act in uninhibited ways when they think no one can find out who they really are. The lack of public self-awareness is related in some way to the thinking that, because individuals may not encounter others in their off-line life, they tend not to worry about being evaluated and thus more easily vent negative feelings towards each other (Preece, 2000).

While the above-mentioned researchers studied online communities from social and communication contexts, others, such as Horrigan (2001), Elvin (2002), Bickel (2003) and Cammaerts and Audenhove (2003), studied them from a political context. Apparently, they were interested in finding out the effect of these communities on democracy and the political public sphere. Interestingly, their findings with respect to these issues appear to have a lot in common. One of the most important things that can be drawn from these studies is the conclusion that the Internet does foster a public sphere, despite the fact that this online public sphere does not meet all the requirements outlined by Jurgen Habermas[3]. Although, this online sphere facilitates civic engagement and public opinion formation, and promotes other democratic values, such as freedom of expression and open access, it does not facilitate rational-critical discussions or smooth the process of reaching consensus among communicators, and does not eliminate the domination of "educated" men, which are all requirements for a "true" public sphere (Habermas, 1989). Having said this, the above-mentioned authors like others (see Dahlberg, 2001; Underwood, 2003; and Ulrich, 2004) still, despite these limitations, value it as a unique sphere as it gives people the ability to organise themselves, communicate with government officials about their local affairs, and oppose dominant political discourses.

OVERVIEW OF THE STUDY

Conceptual Framework

This study was interpretive and naturalistic. The method was guided by a constructivist paradigm, which emphasises understanding the context and meanings that people make of the phenomenon under study. Social construct theory[4] provided the theoretical lens through which the method in this study was applied and the data were interpreted. Social constructivists recognise the effect of the social environment, culture and religion on how people construct their realities about their world and argue that meaning is developed through the interactions of these factors. Religion and culture in Saudi Arabia not only shape people's attitudes, practises, and behaviours, but also shape the way they see and do things and perceive their lives. This makes social construct theory appropriate for understanding online communities in that society. Similarly, the social environment, in the case of online communities, the "Web-based forum," may also exact some influence on people's behaviour online. This suggests that a Web-based forum can be considered another element through which people could socially construct their reality.

Data Collection and Data Analysis

The method[5] used in this study was ethnography[6], which seeks to produce a written description of a people's way of life, beliefs and daily activities (Fetterman, 1989). The main ethnographic technique used to collect data in this study was silent observation[7] of three political Web-based forums[8] used mostly by Saudis. The forums selected for observation are Al-Saha[9] Al-Siyasia[10] located at www.alsaha.com, Al-Husn[11] Al-Siyasi located at www.qal3ah.net, and Al-Muntada Al-Siyasi located at www.islah.tv[12]. The Internet Domain Names associated with the first two sites are registered with U.S. companies (Asharq Al-Awsat, 2004) while the owners of these sites live in the United Arab Emirates[13] (Al Arabiya, 2004). The Internet Domain Names associated with the third site is registered with a UK company and its owner lives in the UK[14]. The three sites are not only popular in Saudi Arabia but in the whole Arab world. Hundreds of articles and stories from these sites have been reported in the Arab and international media and thousands of people visit these sites daily. Al-Saha Al-Siyasia, for example, receives 700,000 visitors each day (Al Arabiya, 2004). All of these factors and the fact that these forums supported various political currents made them interesting to study.

There are a number of reasons for choosing silent observation. First, the researcher lives in Australia and it is not feasible for him to travel to Saudi Arabia to conduct face-to-face interviews. Second, since the researcher's intent was not to disturb the online communities under study or change the natural behaviour of the participants being observed (Locke et al., 2000), silent observation appeared to be most appropriate. Third, being a silent observer of a number of online communities, instead of only one, means collecting data from multiple sites, which is a practice researchers are often encouraged to adopt to validate their research (Hine, 2000).

Silent observation was conducted over a period of one year from mid-July 2003 to mid-July 2004. For the whole

of that time, observational field notes were recorded daily in a journal. The process of observation occurred in two stages, with the first stage being unstructured. In the first stage of observation, the researcher entered the settings with a broad view, which involved looking at all the discussion topics posted in one day. In the second stage, the researcher focused his attention on events, activities, patterns, and behaviours that were salient in the observed forums.

All forums selected[15] for observation are hugely populated public spaces where anyone with an Internet connection can join them or see their content. Recording, analysing and reporting of such public content, where individuals' identities are shielded, is not subject to "Human Subject" constraints (Eysenbach & Till, 2001; Ess & AoIR Ethics Working Committee 2002).

Data were analysed as they were collected. Field notes were entered daily into NVIVO, a Software package for managing qualitative data. Next, themes that highlighted a particular concept were identified after careful study of each word and each line in the field notes. The next step was assigning nodes in the NVIVO Coder representing the developed themes. These nodes stored all the data related to a particular theme in the field notes. For the purpose of ensuring the appropriateness of these themes, each was defined and evaluated. The process of evaluation involved ensuring that certain phrases (or those similar to them) are found in the text. Following the evaluation process, came the further structuring or organising of all themes (nodes) into groups based on the general concepts of the research issues they addressed.

THE STUDY RESULTS

The Importance of POCs in Society

POCs in Saudi Arabia are becoming increasingly important. The number of people who operate in these communities is in the order of hundreds of thousands. While there are no confirmed figures about the number of POCs in Saudi Arabia, when the term "Online communities" was entered (in Arabic) in the Google Search Engine, 358,000 hits were returned. Similarly when the term "Arabic Saudi POCs" was entered, 43,500 hits were returned. This clearly shows that POCs in Saudi Arabia are receiving unprecedented attention. A topic like "the War on Iraq," for example, in Al-Saha Al-Syiasia, which is by far the most widely spread POC in Saudi Arabia, was read by POC members and others more than half a million times since it was posted.

People

There were many types of people who operated in POCs in Saudi Arabia. In terms of the socio-economic background of participants, there were medical doctors, businessmen, university lecturers, senior government officials, government servants, students, prominent intellectuals and journalists. In terms of their ideologies or the religious or political currents that they supported, members were perceived by others or themselves as reformists, Islamic fundamentalists, Mujahideen[16], pro-government, secularists or moderate liberals. Interestingly, there was a notable absence of females in POCs. The vast majority of topics and discussions were dominated by men. During the process of observing Al-Saha Al-Syiasia, for example, only a few female participants were noted. One obvious reason for the notable absence of females in POCs is the fact that females in Saudi society are known to be less interested in politics than men. Discussing politics, either local or international, was rarely among their favourite topics (Islam Memo, 2004).

Purpose and Nature of Interaction

As mentioned above, politics, particularly world politics, to men in Saudi Arabia and indeed elsewhere in the Arab world, is a "hot" and controversial topic, and is a salient feature of life style. In the off-line community when people visit their friends and relatives, or take them to coffee shops, or during social functions such as the marriage or the death of a relative, they mainly discuss politics. Similarly, people used POCs as places to get together for the purpose of expressing their views on matters that are important to them, sharing with others what they think or know, making sense of what is happening in their world, exchanging and challenging different ideas, and making and offering their interpretations about local and world events.

One of the interesting observations is that people in these communities managed to organise themselves and take a common stand about a political matter that could affect them, in a way not previously possible. An example of this is Crown Prince Abdullah Bin Abdul Aziz's initiative to send Muslim troops to Iraq in an attempt to restore peace in the country.[17] His plan was heavily criticised by POCs' members in all the observed communities, who argued that a Muslim nation should not support the enemies of another Muslim nation. According to Al-Quds Al-Arabi (2004), this led the government to "practically" withdraw their initiative. This example clearly illustrates that POCs have enabled people to rationally

criticise a crucial political decision, reach a consensus regarding it among themselves, and communicate their opposing views about it to government officials. This example also, and others below, suggests that POCs may constitute a public sphere which includes some of the elements of the "true" public sphere advocated by Jurgen Habermas (see a brief discussion about the criteria of public sphere above).

Discussing public affairs critically and rationally and reaching a consensus did not always happen in Saudi POCs. In fact, disagreements among members online about many of the issues raised within discussions were quite common. Sometimes language in these discussions was observed to be sarcastic or rude and hostile. One reason for this could be the features associated with the online medium such as anonymity and lack of public self-awareness which, according to Joinson (1998) and Mar (2000), cause abandonment of social inhibitions. The absence of face and body and the lowering of risks and consequences that are associated with a particular action online may make participants less pressured to behave according to their usual standards, values and norms. Another reason could be the division of members in POCs, as mentioned above, into groups based on their ideologies or religious convections. Many members have been observed to strongly support the cause or goal of their group. They appeared to be exceptionally attached and committed to the political current or religious philosophy that they supported. They stood by what they believed regardless of what others thought. They helped those who belonged to their groups by posting topics that were always in line with their goals or causes. This caused POCs to become sometimes battlefields for fights that revolved around differences in religious beliefs or ideologies. Many fights, for example, took place between Islamic extremists and moderate liberals and between Islamic fundamentalists and Shiite sympathisers.

The absence of consensus among members and the existence of fights and disagreements in views in the studied POCs may suggest that Jurgen Habermas' model of the public sphere cannot be applied here, as consensus, for example, based on rational debate, is a crucial factor in his model. On the other hand, the presence of these factors validates, to some extent, Lyotard's[18] argument about communication. Lyotard states that the goal of communication is not reaching consensus as Habermas would argue because that would be based on two invalid assumptions: that "it is possible for all speakers to come to agreement" and that "the goal of communication is consensus." To him the goal of communication is "paralogy" (Lyotard, 1984), which Lois Shawver[19] explains as a flood of good ideas that are inspired by conversation but which usually lead to disagreements and fights.

Topics in Saudi POCs

Political discussions in POCs varied in nature. The topics of these discussions appeared to centre on news from Satellite television stations such as Al-Jazeera[20], news related to major local events such as those witnessed by people but not covered by media, and news related to local current affairs. The war against Iraq accounted for a significant portion of the forums' content. Members posted topics daily that described the situation in Iraq and presented the latest news on fighting. They also updated other members with news that could not be found in the media. They regularly posted images and video recordings of the war taken from non-media resources. They also posted topics that offered commentaries on these events. In these commentaries, they synergised ideas and analysed events and sometimes provided predictions for what might happen in the future.

The Role of POCs as Media Tools

Due to the widespread use of POCs in the country, even traditional media, such as local television stations and newspapers, have been observed to take some of their news from them. For example during the capture of Saddam Hussein, most international media showed the hole in the ground at the farm where he was hiding. One author in Al-Saha Al-Syiasia, who posted a topic that included that picture, wondered why the color of the dates (brown sweet edible fruit of a palm tree) that appeared in the picture were yellow in a time of the year (December) when the color of the dates in the trees should look otherwise. His article received a great deal of attention from POCs' readers. The next day, Al-Watan daily newspaper discussed this article on the front pages.

There is another interesting example, which shows the interactions between traditional media and POCs. The government released, on national television and one of the daily newspapers (AlRiyadh), information about a body of one of the Mujahideen which they found buried in the desert. In their story they said that his friends chose not to take him to hospital for fear they would be identified and captured. As a result they let him die of his wounds. In their story, they also showed the face of the dead person and his body. Obviously, this was an attempt to condemn the acts of Mujahideen and belittle them in the eyes of their supporters and those who think Mujahideen acts are legitimate. Mujahideen, who operated in the forum, were not happy with that coverage and as a result they responded by posting a topic in the forum which caused a sensation. In their topic they asked why the body of the deceased person did not decompose after two months of burial. Muslims believe that those killed in a

battlefield defending their country are martyrs. They also believe that the bodies of martyrs are kept intact in the graves. According to Mujahideen, if this man's body did not change or decompose after so long, it meant he was a martyr. The next day, the government released in Al-Jazirah daily newspaper the medical certificate of the deceased person and some images which showed a lot of deformity from decomposition to his body. The interaction between traditional media tools and POCs clearly show that POCs are regarded by the public as valuable media tools. One of the reasons that made information that appears in POCs worth reading was the inclusion of images, audio files and video recordings with most of the topics posted to serve as supporting evidence.

The Role of POCs as Facilitators of Freedom of Expression

POCs have benefited individuals in Saudi Arabia in a number of ways. First, many people find that their off-line community offers them less of a chance to express their opinions and views, simply because they often do not find people around them of similar intellect. In POCs, however, people often find themselves with others who share common intellectual standing or share similar mindsets. Second, in the off-line community, particularly during the many social functions and family gatherings, elders often dominate discussions. This is because hierarchy in family structure is very significant in Saudi Arabia. During formal social gatherings, younger individuals, out of respect for elders, normally do not speak out. This makes it difficult for younger individuals to contribute to discussions. Online, however, and due to the anonymity inherent in the medium, people, regardless of age, gender, wealth or race, are all entitled to voice their opinions and share their ideas. Third, freedom of expression in general in Saudi Arabia, and indeed in many other Arab countries, is still a little limited. This makes people less capable of speaking their minds in real life. In POCs, however, people were able to express themselves and present their ideas and views to other participants in their community in a way not previously possible. This made POCs "an opening" or a "gateway" where participants could voice their opinions on many topics, particularly politics. It should be noted that, while it is true that the Internet in Saudi Arabia is subjected to heavy censorship, many online forums such as those studied were not blocked from public access.

CONCLUSION

People in Saudi Arabia regard politics as their favourite and dominant topic of discussion because the region itself is politically agitated. Unfortunately, television and newspapers are, to some extent, in the hands of the government and content disseminated from these sources has always been geared toward the government's plans. The findings of this study show that POCs are the new media tools which people now have in their hands. People from all backgrounds, such as reformists, Mujahideen, Islamic fundamentalists and government supporters, are using POCs to communicate their ideas to others. Their use of POCs is not only making them authors of media content instead of being a passive audience, but also making these tools a valuable source for information about politics and a perfect medium for people to let their voices be heard and get their messages across. In that sense, and given that freedom to verbalise one's ideas and views in Saudi Arabia is a little limited, POCs have also become a channel through which people can use to express themselves, share information with others, and present their views and ideas to the rest of the world.

Looking at POCs in Saudi Arabia from a political science point of view, the findings revealed in this study seem to be consistent with the literature (see, for example, the studies by Dahlberg, 2001; Elvin, 2002; Cammaerts & Audenhove, 2003; Ulrich, 2004). The studied POCs offer a public sphere that, although different from what Habermas has envisioned, should be considered very valuable for Saudi society particularly because of the remarkable results people have achieved through it as detailed above, and the absence of other alternatives. It would appear that POCs in Saudi Arabia will continue to grow in the future, make a significant positive impact on society and gain more popularity among citizens. They are also likely to continue drawing media attention and attract more people from other countries. While this article does not offer a comprehensive account of POCs, it hopes to spark interest in the topic. It would be very useful to examine in-depth the role of POCs in Saudi Arabia on local media, the political public sphere and the democratic process. This could be achieved by carrying our research that perhaps employs quantitative techniques such as surveys or content analysis or both.

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KEY TERMS

Asynchronous: Denotes a communication method which participants use to interact in a time-delayed context, that is, without everyone gathering at a particular time.

Inhibition: Inhibition occurs when behaviour is constrained or restrained through self-consciousness, anxiety about social situations, worries about public evaluation, and so on (Joinson, 1998, p. 44).

Mujahideen: Mujahideen are, in the context of this article, those who consider their militant acts a form of Jihad. The government sees them as terrorists.

Political Online Community (POC): An online community (see a definition of this term above) whose members are interested mainly in discussing local and international politics.

Public Sphere: "A domain of our social life in which such a thing as public opinion can be formed. Access to the public sphere is open in principle to all citizens. … citizens act as a public when they deal with matters of general interest without being subject to coercion" (Habermas, 1989, p. 231).

Social Construct Theory: Social construct theory considers reality about a particular phenomenon as the individual construction of individual realities and that these realities are influenced by individuals' society, culture, language and social environment.

Web-Based Forum: A specific type of softwares that facilitates public discussions through the exchange of messages which are accessed by clicking a hyperlink.

ENDNOTES

1. Other names for forums are online message boards, electronic bulletin board, and online conferences.
2. This is opposite to "inhibition"—see Key Terms above.
3. See Key Terms for a brief definition of the "public sphere."
4. Social construct theory is one of two constructivist theories. Another theory is the personal construction of reality.
5. This researcher takes the position of distinguishing between the terms "technique" and "method." The former is used to mean the specific procedures that are used to collect or analyse data. The latter is used to mean the general rules that govern the implementation of these procedures.
6. For a detailed description of ethnography see Al-Saggaf et al. (2002).
7. For a detailed description of this technique see Al-Saggaf et al. (2002).
8. The term "online forum" should not be thought of as a synonym for the term "online community." The former should be understood as a "platform," "place," or "environment."
9. Al-Saha, and also Al-Muntada, in Arabic means a forum.
10. Al-Siyasia in Arabic means political.
11. Al-Husn in Arabic means a fortress.
12. MIRA Movement for Islamic Reform in Arabia.
13. This information was also obtained using www.Uwhois.com, retrieved August 8, 2004.
14. www.islah.tv, retrieved August 11, 2004 and www.nitaqat.com, retrieved August 15, 2004.
15. For a detailed description of the design of these forums see Al-Saggaf et al. (2002).
16. See Key Terms above for information on this term.
17. CNN (2004). *Powell welcomes Saudi plan on Iraq*. Retrieved July 29, 2004 from CNN World Web site: http://www.cnn.com/2004/WORLD/meast/07/29/powell.
18. A known French philosopher.
19. Shawver, L. (2003). *Lyotard's Concept of Paralogy*, Retrieved August 16, 2004, from PostmodernTherapies NEWS Web site: http://www.california.com/~rathbone/paralog2.htm.
20. "Al-" in Arabic is translated as "the" in English.

Potential Implications of IPv6 for Regional Development

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INTRODUCTION

The Internet started as a project by the Advanced Research Projects Agency of the U.S. Department of Defense in the late 1960s. Since then, it has evolved to be the biggest network of all, although its core function, to create a network of networks, has not changed. It is this very connectivity that gives rise to a series of applications making the Internet such an interesting proposition for a number of business and personal activities.

In order for the Internet to evolve into its current form, a lot of research time has been invested in advancing networking. Arguably, the most successful product of all these research projects was the Internet Protocol (IP), a network protocol that has been significantly reliable and has underpinned communications on the Internet for more than 20 years. The achievement of the designers is even greater, if one considers that they had no previous experience with such a large networked environment! The growth of the Internet, and the expectations attendant on that success, meant that action had to be taken to address the approaching limitations of IPv4 and the extent of its functionality.

The critical importance of this update to economic development is clearly highlighted in view of the cost-related benefits that the Internet has brought to firms, especially SMEs (Mustaffa & Beaumont, 2004; Walczuch, Van Braven, & Lundgren, 2000). If the network could not cope with increasing demand, SMEs would find themselves in a very difficult situation, not only because their day-to-day operations and processes would be threatened, but also because their customers have much higher expectations now that they have a more thorough knowledge of the benefits that the Internet can provide. Apart from the implications that an update may have on the economy, it may also affect many other areas of our daily activities, which have become Internet-oriented: e-learning, online entertainment, easy and instant access of information, participation in virtual communities, our work habits (e.g., teleworking, thus promoting decentralisation) and so on.

The following sections aim to provide a brief non-technical overview of the shortcomings of IPv4 and explain how IPv6 addresses these. A discussion then follows of the implications of a protocol update with an example of how such an update could influence a well-established industry (Television Broadcasting).

INTERNET PROTOCOL VERSION 4

Although introduced in 1981 with Request for Comments 791 (RFC Editor, 1969-2004), Internet Protocol version 4 (IPv4) proved so robust that it has not been substantially changed since its introduction. When it was introduced, the Internet consisted of less than 1,000 hosts (Zakon, 2003), however, the initial design was scalable enough to allow for the tremendous expansion of the network in the mid-1990s.

New developments and the demand for Internet-connected devices (for example, mobiles phones and handheld computers) stretched IPv4 to its limits. One of the main issues that needed to be addressed was the depletion of IP addresses. An IP address is a number allocated to an Internet-connected device. Data flows in the network between the source and the destination in segments (packets) based on the IP addresses. An IPv4 address consists of four bytes (32 bits), also referred to as octets. This means that there is an address space of 2^{32} addresses resulting to in 4,294,967,296 unique addresses. As demand for IP addresses increased, alleviation techniques such as the Network Address Translation (NAT) were introduced, although these only addressed the symptoms of the problem rather than the problem itself.

Another limitation of IPv4 is its lack of security. An extension of the protocol known as Internet Protocol

Security (IPSec) exists, but this is optional and its implementation limited. Moreover, IPv4 does not fully provide Quality of Service information (QoS), which is essential when dealing with data that has to be delivered in a timely manner. Although a delay of a few seconds when delivering an email is not considered an issue, this is not the case for Video on Demand (VoD). As with IPSec, IPv4 has an option for the packets to carry information about the type of service (ToS), but again this has its limitations. In 1999, to address these and other issues (such as maintenance of large routing tables or the need for simpler configuration), the Internet Engineering Task Force (IETF) introduced Internet Protocol version 6 (IPv6) (Internet Architecture Board, 1999).

INTERNET PROTOCOL VERSION 6

IPv6 has been designed not only to address many of the issues raised by the limitations of IPv4, but to also add extra functionality, creating new networking opportunities. The Internet Architecture Board designed IPv6 "to enable high performance, scalable Internetworks that should operate as needed for decades" (Internet Architecture Board, 1999).

To start with, IPv6 employs a 128-bit address space, resulting in 3.4×10^{38} addresses. With the ever-lowering cost of Internet connectivity, this means that true end-to-end connectivity to the Internet will be inexpensive. In its turn, this will allow more people to have truly private communications.

The large address space may give rise to networking issues, such as the addressing hierarchy and auto-configuration. Addressing hierarchy refers to the way that IP addresses are deployed. The IPv4 address space is a 'flat' address space, in contrast to IPv6 which uses logical groups to index addresses, greatly simplifying the delivery of a packet. Auto-configuration is important because it allows devices to connect to the network simply, in a plug-and-play manner, which reduces the administration required. Auto-configuration becomes even more important when one considers the number of devices that the network will have to cope with, in particular mobile devices that already seek Internet connectivity. As these devices move from one network segment to the other, their connection will automatically be reconfigured.

This new level of connectivity will transform existing mechanisms of delivering goods and services. For example, it could address "the real challenge of managing information on a regular basis" that Zhu's Web-based decision support solution for regional vegetation management faced (Zhu, McCosker, Dale, & Bischof, 2001).

Internet-connected sensors could have been deployed, transmitting information directly to the solution without human intervention.

The large address space may also create new opportunities, such as IP-based television broadcasting, which is discussed next, fostering entrepreneurial activities. The speed of the Internet coupled with common local conventions of trust-based relations can facilitate interactions between firms for intensive knowledge transfer (Eng, 2004), which can help build on existing regional competence based on local specialization.

Furthermore, in IPv6, the use of IPSec is mandatory. Apart from its powerful encryption, IPSec also provides accurate authentication (ensuring that the packets really originated at the site specified) and non-repudiation (which prevents the sender from later claiming they did not send the packet). In addition to the earlier mentioned, IPSec ensures message integrity ensuring that the packets are not tampered with while in transit. This added security can help reinforce users' confidence and trust in online communications and online transactions, boosting e-commerce. This is of particular importance when it comes to smaller organisations who have limited resources (Williams, 2003), as lack of adequate security can have severe implications.

Finally, it should be pointed out that there exist mechanisms (such as that of "tunnelling") to allow networks based on IPv4 to communicate with IPv6. This means that a conversion from one protocol can be achieved gradually.

UNICAST, MULTICAST, AND ANYCAST

Unicast refers to a one-to-one communication, for example, a user connecting to a Web server in order to request a Web page.

Multicast refers to one-to-many communications, that is, the delivery of the same data, sent by the source once, to multiple destinations. Broadcast is a special type of one-to-many communication and refers to the transmission of the same data, to all nodes in a network segment, separately.

By transmitting one copy of the data, multicast can reduce the server and network workloads, as otherwise the server would have had to send a copy of the data to each client. As such, multicast can result in a substantial reduction of network utilisation during a transmission. During a multicast session, multiple nodes can be registered to a specific multicast group, and this group is assigned a multicast address. Multicast addresses correspond to 1/256 of the total address space that IPv6 provides.

The availability of multicast by itself does not imply that there will be additional demands for bandwidth. The need for bandwidth will only be determined by the applications that use multicast-based delivery. Examples (Deering & Cheriton, 1990) of applications that can take advantage of multi-destination delivery include:

• Updating all copies of a replicated file or database;
• Sending voice, video, or data packets to all members of a computer-mediated conference; and
• Disseminating intermediate results to all participants in a distributed computation.

Applications aiming to distribute multimedia content (e.g., TV/Radio stations) or software (e.g., the latest security patches) will require new levels of bandwidth. On the other hand, applications distributing the latest information (such as news or stock prices) will need significantly less bandwidth.

Finally, an anycast address is one that corresponds to more than one IP address. A packet sent to an anycast address will be delivered to the closest node. Should that node be "down" or unreachable, the packet will be delivered to the next closest node and so on, providing automatic failover. Services such as the Domain Name Service (DNS) or the HTTP proxy could also benefit from anycast. The users will not be required to know the addresses for these services in order to use them, as the network itself will automatically select their closest node.

Both IPv4 and IPv6 support unicast, multicast and broadcast (which in IPv6, is simply a form of multicast), with IPv6 also supporting anycast.

MIGRATING TO IPv6

When considering emerging technologies there is always the uncertainty that they may not find their way to market. IPv6 was introduced many years ago, but has yet to see a large-scale deployment. Such deployment does not mean that IPv4-based networking will be switched off overnight. There will be a long transitional phase, the length of which will mainly be determined by the level of demand for more Internet-oriented products and services, and hence for a larger address space. For example, the U.S. Department of Defense plans to migrate to IPv6 in order to facilitate integration of the essential elements of its Global Information Grid—its sensors, weapons, platforms, information and people (United States Department of Defense, 2003).

In addition to the absence of "overwhelming demand" that would necessitate a migration, there are other factors for the delay. These include "the operational cost of conversion, operational conservatism, the lack of strategic incentives in a fundamentally short-term industry and the cost of not converting which is spread too thinly and is not understood properly by decision makers" (Carpenter, 2003).

There have been many initiatives to speed up the migration to IPv6 by deploying networks that are based on the new protocol. An example is *6bone.net*, which is "a test-bed to assist in the evolution and deployment of IPv6" (http://www.6bone.net). Such efforts helped develop "the Next-Generation Internet Protocol, which has been approved as a Draft Standard, so that it is known to be highly stable and appropriate for productization" (Internet Architecture Board, 1999).

While IPv4 still managed to cope with demand, decision makers have postponed plans for a conversion to IPv6. Still, "given the remarkable growth of the Internet, and business opportunity represented by the Internet, IPv6 is of major interest to business interests, enterprise Internetworks, and the global Internet as it presents all networking interests with an opportunity for global improvements, which is now receiving the collective action that is needed to realize the benefits" (Internet Architecture Board, 1999).

FUTURE TRENDS: IPTV—IMPACT AND IMPLICATIONS OF IPv6 ON A WELL-ESTABLISHED MEDIUM

A technology is as good as the problems it can solve or the opportunities it can create. The Internet has affected regional development by fostering economic development and by bringing down communication barriers. Its limitations though could prevent future development. IPv6 will not only resolve a lot of the issues that the growth of Internet has caused, but will also allow for new services to be introduced.

The first and most direct effect of IPv6 will be the accommodation of the ever-increasing number of devices seeking Internet connectivity. Having a 128-bit address space means that about 10^{23} addresses correspond to every square meter of the Earth! The built-in security will make transacting over the Internet safer than ever, reinforcing the trust and confidence that are required in a networked environment (Davies, 2002).

Although improving networking is of crucial importance, one could argue that the applications that will find their way to market will be those which help users to undertake tasks in more efficient ways or enable new applications. An example may be the introduction of Internet Protocol Television (IPTV), that is, the continuous broadcasting of video streams over the Internet. Multicasting could lower the barriers of television broadcasting by providing an elegant solution to the problem

of requirements for bandwidth when it comes to scaling up the number of viewers.

The implications are enormous if one considers the influence of television in our daily lives. IPTV stations will have the potential to reach hundreds of millions of viewers at a fraction of the cost that traditional TV stations would have required to invest. IPTV has all the potential to start a new revolution in its own right, enabling new and traditional broadcasters to reach minorities of viewers around the globe who would be interested in their specialised content. The Internet could take advantage of television's Achilles heel: narrowcasting.

On the other hand, bringing down regional barriers in an area that is well-regulated will raise questions of the adequacy of existing policies, monitoring and law enforcement. Cultural issues may arise from even the most innocent broadcasts. What is taken for granted in one place may be considered an insult in another. The existing frameworks may be rendered obsolete by the introduction of a new technology.

The introduction of IPTV "broadcasts" in this sense could act as magnets for regional groups of like-minded citizens, otherwise unable or indeed unaware of the potential community of others around them who are of a similar mind. The reduction in cost of broadcasting represented by the technology behind IPTV means that it is no longer impossible for smaller, special interest groups to create their own strand of programming, with content and format most likely to attract viewers of similar interests and enthusiasms.

An example of such case, although only Video-on-Demand rather IPTV, was NRK in Norway (Bryhni, Lovett, Maartmann-Moe, Solvoll, & Sorensen, 1996). The station provided clips of its local news broadcasts over the Internet in order to better serve viewers who had an interest in this localised content, but did not have any means of receiving it. This service was one of the first regular real time news on-demand services, where a television station digitized a full news transmission on a daily basis and made it available to the public over the Internet.

Just as top line examples, an IPTV channel for the hard of sight, for model makers, for the caring professions in a particular region, would have strong attractions and immediate local, regional and social value.

Moreover as technologies like the Internet and IPv6 are, in principle, widely available beyond narrow regional geographical boundaries, entrepreneurs can exploit opportunities without seeking them outside their local communities (Venkataraman, 2004).

CONCLUSION

IPv6 has been delayed for a number of reasons but will eventually be widely deployed, forming the base of the next significant improvement of the Internet. Practitioners will look to the emerging technology seeking new opportunities, while users will expect new levels of connectivity and relevance, anticipating the latest innovative applications. Policy makers should at least be aware of, and ready for, the next wave of developments. If they are not, it will rapidly become apparent that to stay still in the turbulent world of technological development, they must not drop behind those bodies that take advantage of technology. Avoidance of such advances has a very real cost.

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KEY TERMS

Anycast: Introduced in IPv6, associates an address with multiple nodes. Packets sent to an anycast address are routed to the nearest node having that address, depending on the distance of the routing path. Anycast can be used to provide high availability (automatic failover) and load balancing for stateless services, for example, access to replicated data.

Bandwidth: Refers to the range of frequencies available for a specific broadcast, for example, radio/television channels, mobile phones and so on. In computer networks, bandwidth refers to the amount of data that can be transferred in a given period of time.

Internet Protocol (IP): A network protocol that provides connectionless, best-effort delivery of datagrams (self-contained, independent set of data). IP and Transmission Control Protocol (TCP) are the networking protocols that the Internet is based on.

IPTV: The result of large-scale adoption of broadband, as well as advances in networking technology and digital media, which together have made it possible for service providers to economically deliver high-quality live and on-demand movies and TV content over IP networks.

Multicast: A technology that allows to deliver data, sent once, to multiple destinations, hence reducing bandwidth requirement. Applications that could benefit from multicast are multimedia broadcasts, like video and audio broadcasts, distribution of news, software and others.

Narrowcasting: Sending data to a specific list of recipients as opposed to, for example, network TV which uses a broadcast model in which the signals are transmitted everywhere and anyone with an antenna can receive them. Most Web sites use a broadcast model since anyone with Internet access can view the sites. However, sites that require log-in before viewing content are based more on the narrowcast model.

Tunnelling: Allows one network to transmit its data via another network's connections. In the context of the IPv4/IPv6 discussion, tunnelling refers to the encapsulation of IPv4 data in order to be carried by an IPv6 network, or the opposite.

Unicast: The point-to-point delivery of data, for example, when a Web server delivers a page to a visitor.

Video on Demand: Technology that allows you to order a video broadcast, for example, a Hollywood movie, at the exact moment you want to watch it, with no pre-set start times. VoD also allows you to control the broadcast you are watching just as it would be possible with a VCR, for example, the ability to fast-forward, rewind and pause your movie at any time.

Poverty, Inequality and New Technologies in Latin America

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REALIZING THE POVERTY REDUCING POTENTIAL OF ICT IS NOT AN AUTOMATIC PROCESS

Poverty and inequality represent two enormous challenges for the countries of Latin America. In 2002, about 220 million people (44% of Latin Americans) were poor, and the average incomes of the richest 20% of the population were between 10 (Uruguay) and 44 times (Bolivia) higher than the average incomes of the poorest 20% (ECLAC, 2004). In an age where ICT is bringing about profound changes to societies, it is thus relevant to analyze whether these technologies can contribute to poverty reduction, and what the impact on inequality may be.

ICT can be utilized to support poverty reduction strategies by improving poor people's access to education, health, government and financial services. In a region where about half of non-agricultural employment is in the informal sector, ICT can also help micro and small entrepreneurs by connecting them to markets. It is also clear, however, that ICT on its own cannot leapfrog the old institutional and organizational weaknesses of the Latin American economies: digital technologies can be used as a tool to execute solutions to poverty, but cannot root out poverty on their own. The risk that ICT actually ends up contributing to higher inequality is very much real (Cimoli & Correa, 2003). Insufficient information and communication infrastructure, high access costs, and low levels of education have so far bestowed the benefits of ICT on the better off, urban segments of the population to the detriment of the poor and rural areas.

Micro and Macro-Economic Evidence

An economic model presented in Cecchini and Scott (2003) shows why the rich and the poor use different communication techniques and how the nature of technological change has until now been biased towards the rich, widening the digital divide. Since the value of time is lower for the poor—due to underemployment—and the cost of ICT capital is high, when ICT consists of oral and written communication versus fixed-line telephony, the poor tend to communicate orally. The rich, who face the opposite constraints, choose to communicate via fixed-line telephony, which is relatively capital-intensive. When the Internet, requiring more capital per unit of information communicated than any other existing technique, becomes available, the rich switch from fixed telephony to Internet usage, while the poor continue to communicate orally. Therefore, the model has two implications for a pro-poor ICT policy. First, the relative price of capital for communications purposes should be reduced for the poor. Second, the focus of research and development in ICT has to favor poor-user friendly hardware and software.

The widening of the digital divide within countries is substantiated by macro-economic evidence. Forestier, Grace and Kenny (2002) show that historically telecommunications rollout has benefited the wealthy, with a positive and significant impact on increasing income inequality within countries. The authors' regressions illustrate that countries with high initial teledensity (allowing for income) and countries that have high growth in teledensity (allowing for growth in income) see significantly higher growth in income inequality. The diffusion of the Internet in developing countries is said to be following a similar pattern, suggesting that it is a force for growing income inequality. Without intervention, ICT might be even more strongly "sub-pro-poor" than has been true for the telephone. The Internet, in fact, requires not only more ICT capital but also a higher level of education and skill to operate than the telephone (Forestier et al., 2002).

As Heeks and Kenny (2002) point out, the diverging effects of ICT may be a consequence of the fact that ICT was almost entirely developed within the context of high-income countries. ICT was thought for a capital-rich setting, and embodies significant quantities of technical, human, and institutional capital. Since rich countries already have a large stock of personal computers (PCs) and telephone lines, Internet access represents a small marginal investment compared to the existing fixed stock of ICT capital. They also have more educated, highly-skilled employees to install, operate and maintain ICT. In developing countries, with few PCs, limited telephone networks, and lower levels of human capital, the

same is not true. Furthermore, ICT embodies within it rich countries' assumptions about "ICT-friendly" institutional strategies at the organizational level and ICT-friendly laws and regulations at the national level. For developing countries, where such institutional arrangements are less likely to exist, ICT warrants a range of investments in institutional reform.

Access to ICT within Latin American Countries

Latin Americans, on average, have lower levels of access to ICT than people living in high-income countries. Similarly, within Latin America, people living in lower-income countries generally have lower levels of access to ICT than those living in higher-income countries. Both phenomena are expression of the international digital divide.

The internal divide means that different socio-economic groups within countries also have different levels of access to ICT. Within Latin American countries, the poor have much worse access to ICT than rich or middle-class citizens. In Chile, in the year 2000, only 32% of the poorest 10% of households had a fixed or mobile phone; computer presence (1.9%) or Internet connection (0.8%) in the poorest households was even more infrequent. On the contrary, among the richest 10% of Chilean households, 60% had a computer and 38% an Internet connection; almost all (95%) had a fixed or mobile phone (SUBTEL, 2002). In Uruguay, on average, 10% of the population has access to a PC. However, only 2% of low-income Uruguayans have a PC at home, compared to 22% of the middle class and 58% of the upper class (Finquelievich, 2002). In Lima, Peru, in the year 2000, in the richest 4% of households, 80% had a PC at home and 54% connection to the Internet, while among the poorest 50% of households almost no one had either (Melo, 2002).

The internal divide is not limited to income, but also extends to education, gender, age, and ethnic inequalities. More educated people have better access to—and make better use of—ICT. Stratification and inequality in regional educational systems, where secondary and tertiary education have tended to become more elitist, extend to levels of access and use of ICT by students (Hopenhayn, 2002). In Chile, for instance, 89% of Internet users have had tertiary education (UNDP, 2001). The percentage of female Web users in Latin America and the Caribbean has been estimated at around 38%, which is far from gender parity, although the gender gap seems to be closing in many countries (Bonder, 2002; UNDP, 2001; SUBTEL, 2002). Older people are also at a disadvantage. In Mexico, in 2002, 36% of people, ages 20-29, used the Internet, against 9% in the age group 40-59. In the 60 and above age group, Internet use was only 4%. In the year 2000, in Costa Rica, Mexico and Panama, the probability of having a computer at home was five times higher for non-indigenous sectors of society than it was for indigenous people (ECLAC, 2003).

Urban areas are much better connected to ICT than rural areas. The case of Peru is illustrative: in Lima, 45% of households have a fixed-line phone at home and 18% own a cellular phone, while only about 0.5% of rural households own a fixed-line telephone or a mobile phone. The divide is no better with respect to PCs and Internet. In Lima, 14% of households have a computer and 2% Internet access at home, while in rural areas of Peru these percentages are about zero (INE Peru, 2003). In Chile, in 2000, only 0.8% of rural households had access to the Internet, compared to 9.4% of urban households (SUBTEL, 2002).

ICT PROJECTS FOR POVERTY REDUCTION IN LATIN AMERICA

Two areas can be identified as priorities for reducing poverty: developing poor people's capacity—mainly by improving their access to education, health, and government services—and increasing their opportunities—by improving their access to markets and the labor force. Although most of the poor in Latin America are isolated from the information revolution, there are examples that provide evidence of possible uses of ICT to support poverty reduction.

Improving Access to Education, Health and Local Government Services

In Brazil, the *Committee for Democracy in Information Technology* (CDI) has provided computer and civics training to young people living in urban slums, or *favelas*, since 1995. CDI emerged from the belief that computer literacy can maximize opportunities in the job market and promote democracy and social equity. Along with training in word processing, spreadsheets, accounting programs, and Web design, CDI teaches civic participation, nonviolence, human rights, environmental awareness, health, and literacy. There is growing anecdotal evidence of CDI's success on several fronts. After a three or four-month course, graduates are said to find well-paid jobs, start micro-businesses, or become certified teachers within the organization. Some CDI graduates who had dropped out of public school have decided to go back and complete their formal education; many others put their computer skills to work in various community activi-

ties, including health education and AIDS awareness campaigns. CDI has established almost 800 schools in 20 states in Brazil, training more than 460,000 children and youth (CDI, n.d.; World Bank, n.d.).

Since 2001, the *Hispano-American Health Link* program (EHAS), led by the Technical University of Madrid and the NGO Engineering without Frontiers, has developed low-cost voice and email communication systems based on VHF radio and solar power. These systems were designed for rural primary health care personnel of the isolated Peruvian Alto Amazonas province, where most health establishments did not have any telecommunication system. Special attention to maintenance has been paid setting up local security backups for all hard drives and a remote maintenance system to reach all the computers through radio links. Before coming up with this technological solution, EHAS carried out a study on the information and communication needs of health personnel, which identified as main problems poor infrastructure, time spent traveling to transmit administrative reports, lack of feedback information on epidemiological topics, and insufficient training. As a result, EHAS decided to center its services on remote access to health information and on distance training. Each week, an electronic health training publication is sent to health personnel, and courses on childhood and maternal health, childhood diarrhea, infectious diseases, nutrition and other prevalent diseases of rural areas are sent through email. These distance courses can be used off-line and have a system for self-examination and remote evaluation. Furthermore, health personnel can now use email to receive information from health experts. Impact evaluation is an integral part of the EHAS project, as evaluations are conducted every six months (Martinez et al., 2002).

In Brazil, since 1995, the state government of Bahia has created *Citizen Assistance Service Centers* (SAC) that bring together 29 federal, state, and municipal agencies in a single location to provide more than 500 different services to citizens. The centers, connected to a computer network, offer services such as national identification card issuance, labor identification cards and passports, submission of legal cases in small claims' court, registration of business complaints, application for employment benefits, and job searches. SAC have been placed in convenient public locations, such as shopping malls and major transportation hubs, offering citizens great timesavings and delivering services with courtesy and professionalism. Two mobile SAC, large, 18-wheel trucks, were also developed to reach the most remote and deprived communities in Bahia (Rinne, 2001; Wohlers, 2003).

Improving Access to Micro-Finance and Banking Services and Supporting Pro-Poor Market Development

In Bolivia, *Prodem Private Financial Fund* (Prodem FFP) employs smart cards, voice-driven ATMs and fingerprint recognition technology to provide financial services to low-income communities, as well as to micro and small entrepreneurs. Prodem FFP was founded in 1999, building upon a decade-long experience as a non-profit micro-finance institution. Many of its 50,000 customers are illiterate, speak only the local Quechua or Aymara languages, have no familiarity with modern financial services, and often live in rural areas lacking a reliable telecommunications infrastructure. In order to serve this market, Prodem FFP combines smart cards with digital fingerprint recognition to offer secure access to ATMs with color-coded touch screens. When customers use an ATM, they can choose to receive audio instructions in Spanish, Quechua or Aymara. Since the customers' account balance is stored in the smart card, it is not necessary for the ATM to connect to the Internet to complete a transaction. ATMs are assembled in Bolivia at half the cost of a traditional ATM with more limited functionality (Hernandez & Mugica, 2003).

In El Salvador, the Ministry of Agriculture launched in 2000 *Agronegocios*, a project that offers technical and entrepreneurial training to small farmers and fishermen through computer centers, videos and a Web site with practical information. Ten Agronegocios centers throughout the country offer technical and commercial assistance as well as free access to a Web site with information on recommended crops, market prices, financial costs and benefits of agricultural activities, investment opportunities and a virtual market where product supply and demand can be published. For the centers' management, the Ministry has contracted organizations that have a good track record in agricultural business and support to small farmers (Op de Coul, 2003). In Peru, *Tortasperu*, an e-business based in Lima, sells homemade cakes to expatriate Peruvians living in the United States who order the cakes online and send them as surprises to their family and friends back at home. The cakes are prepared and delivered by a network of housewives living in seven Peruvian cities who have been trained by Tortasperu. Working with Tortasperu requires knowledge of and access to the Internet, mostly through public Internet booths (*cabinas*), in order to receive and complete cake orders (LaFranchi, 2000; Narayan & Shah, 2000).

TOWARDS THE INFORMATION SOCIETY

An effective mix of public and private support mechanisms is required to develop the information society in Latin America. Good governance at the national level has been found to be central to human development and is also a critical factor for the diffusion of ICT at the local level (UNDP, 2002). Therefore, careful formulation and design of national strategies to promote the information society is essential for countries to realize the potential of ICT for poverty reduction. Examples of such strategies in the region, commonly implemented since the year 2000, are the Digital Agenda in Chile, the Connectivity Agenda in Colombia and e-Mexico (ECLAC, 2003).

Given the budget constraints faced by Latin American governments, it is not realistic to provide telephone lines, computers or Internet access to all households ("universal service"). Government and regulators in the region are thus concerned with policy instruments for achieving "universal access," of which community telecenters and public pay phones are the most common examples. Low-cost access to information infrastructure is indeed the basic necessary, but insufficient, condition to reach the poor, as inadequate or absent connectivity, expensive hardware and software, and unstable power supply reduce the economic viability of ICT projects (Kirkman, 1999).

During the 1990s, fixed-line teledensity and mobile phone penetration have grown greatly in the region. However, prices of residential telephone and Internet connection remain high. One explanation for high costs is the existence of impediments to effective competition: during the 1990s, first entrants in the business after privatization often got generous exclusivity periods, as it was the case of the Telefónica Group of Spain (Estache, Manacorda & Valletti, 2002; Rozas Balbontín, 2003). Furthermore, the market by itself has not been able to provide a sufficient level of connectivity to the poorest and most isolated rural areas. Large telecommunications companies give priority to more lucrative urban markets, and are reluctant to enter the smaller, less profitable, rural markets. In Peru, the fixed-line telephony market is officially liberalized, but the incumbent Telefónica del Perú offers the only wireline service outside Lima. Many telecenter operators outside of the capital complain about bottlenecks, delivery at much lower speeds, and slow response to problems. Telecenters in Lima, where there are multiple-service providers, are more likely to lease faster connections and pay lower rates (Best & Maclay, 2002).

The key to achieving connectivity for poor and rural areas is to determine how far market forces will carry the rollout of voice and data networks. The gaps left by the private sector can then be remedied by public intervention through regulatory mechanisms. One alternative is to invite private operators to bid for services in areas that are not commercially viable in return for a subsidy financed from a universal access fund. A concession contract is then awarded to the company requesting the smallest subsidy. In Chile, this mechanism was used by the Telecommunications Secretariat to leverage U.S. $40 million in private investment on the basis of just over U.S. $2 million of public subsidy. As a result, 1,000 public telephones have been installed in rural towns, at around 10% of the costs of direct public provision. In Peru, since 1999 OSIPTEL (Organismo Supervisor de la Inversión Privada en Telecomunicaciones) has subsidized the provision of public pay phones and community telecenters to about 4,500 rural villages and 500 rural district capitals (OSIPTEL, n.d.).

POLICY LESSONS

Even if information infrastructure becomes available at a very low cost, there is no guarantee that the poor will access ICT applications in a meaningful way. What are the lessons learned for pro-poor ICT at the project level?

Appropriate Technology

Some pre-requisites are needed to make the introduction of ICT in development projects cost-effective and sustainable, including not only stable electric power supply and good connectivity, but also human capacity to manage hardware and software. If these essential factors are not present, it may be better to look for low-tech but more appropriate solutions. Radio programming, cheap enough to be produced locally and in a range of languages, could be used for instance to inform farmers about agricultural techniques and commodities prices. In Latin America, most radio programming (as opposed to Internet content) is produced locally or nationally. In Peru alone, an estimated 180 radio stations offer programs in Quechua, a language spoken by around 10 million people and almost completely absent from the Internet (Kenny, 2002).

Community Participation and Ownership

Organizations planning ICT projects in the field should thoroughly assess the information needs of a community to ensure that ICT applications respond to its priorities

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and include gender concerns. Ownership and development of ICT applications in collaboration with local staff foster the success and resilience of ICT projects. Outside control and top-down approaches, on the other hand, waste resources in the initial periods of projects, endangering their future sustainability. In Brazil, CDI schools are created through partnerships with community organizations, NGOs, and religious groups. Communities have complete ownership of the schools, and are responsible for their staffing, management, and maintenance. To develop a CDI school, a community sets up a committee to assess local demand, identify future instructors and a suitable location, and to establish security measures for the computers. CDI trains the instructors, works with the school to obtain a hardware donation from sponsors, helps the school install the computers, and, once a school has been established, serves as a consultant. It is the community that is responsible for making the school self-sustainable (CDI, n.d.; World Bank, n.d.).

Grassroots ICT Intermediaries

In Latin America, direct ownership and use of ICT, for instance, through a PC with Internet access, applies only to a small fraction of the population. Poor people have to rely on a human intermediary between them and ICT, in what is termed a "reintermediation model" (Heeks, 2001). The profile of the intermediaries who add human skills and knowledge to the presence of ICT is thus critical for projects that want to reach the poor (Heeks, 1999). Successful examples of ICT projects for poverty reduction are conducted by grassroots intermediaries that have the appropriate incentives and proven track record working with poor people. A study on telecenter initiatives in Latin America noted that to achieve economic and social development, they need to "be run by someone that is personally committed to the project, willing to contribute his or her own capital and time, backed by the community in which the center operates, and willing to address the community's objectives and needs" (Proenza et al., 2001).

Locally-Contextualized Information and Pro-Poor Services

Content provided through ICT should not be limited to the knowledge that can be accessed from outside sources, but rather extended to ensure that the poor have the means to speak for themselves, as they know their needs, circumstances, worries and aspirations best. In summary, the poor may demand access to locally-contextualized information more than access to existing information from an alien context (Heeks, 1999). It is also advisable

that ICT projects focus on a limited number of well-run pro-poor services, and expand them incrementally, rather than offer a great number of services that end up lying unutilized. Among the core services that telecenters can offer to attract clients and generate revenue, voice and text communication services are among the best candidates. Information systems that connect people to each other despite barriers of time, distance, literacy, and ownership of a telephone or PC are in fact in high demand among poor rural communities (Best & Maclay, 2002).

Awareness-Raising and Training

Raising awareness among the poor about the potential of ICT is another key aspect of successful ICT projects. Word of mouth is often a very powerful tool for publicity: leaders of poor communities, as well as school children, could be brought to telecenters for a demonstration that shows what ICT can do for them. Training poor women and men in information technology skills is also important, as failure to get the poor involved in the use of technology can lead to further marginalization. Since learning is more effective through practice, innovative, interactive and participatory training approaches are required.

Financial Sustainability, Monitoring and Evaluation

A major challenge for ICT projects is reaching financial sustainability but, since most ICT projects are recent, experience on sustainability is limited. The spending capacity of the poor is low by definition and limits the chances to provide for operating costs, which are higher in rural than in urban areas. In rural areas, telecommunications cost much more, computer equipment maintenance is hard to find and expensive, and skilled operating and maintenance personnel are practically nonexistent. Deficiencies in the rural power supply make additional devices necessary, such as voltage stabilizers, surge suppressors, backup power supplies, shock protection, and grounding. Where no electricity is available, recourse must be made to solar or wind energy, which raises costs (Proenza et al., 2001). How will we know whether the benefits derived from existing ICT projects outweigh the costs? In order to answer this question, rigorous monitoring and evaluation (M&E) of the social and economic benefits of ICT projects are needed. M&E measures performance, identifies and corrects potential problems early on, and improve the understanding of the relationship between different poverty outcomes and ICT policies (Kenny et al., 2001).

CONCLUSION

In Latin America, as in much of the developing world, reaching the poor and realizing the potential of ICT for poverty reduction is a difficult endeavor. Low-cost and accessible telecommunications and information technology infrastructure are necessary but insufficient conditions to reach the poor. Key to the success of ICT projects for development, however, are "soft" issues such as local ownership and participation of the community, implementation by grassroots-based intermediaries that have the appropriate incentives to work with marginalized groups, and provision of access to locally-contextualized information and pro-poor services. Attention must be also placed on training, awareness-raising campaigns, financial sustainability, and monitoring and evaluation.

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KEY TERMS

Grassroots ICT Intermediary: Person serving a community by adding human skills and knowledge to the presence of ICT, often operating in a telecenter.

Information and Communications Technology (ICT): Set of activities that facilitate the capturing, storage, processing, transmission and display of information by electronic means.

Internal Divide: The digital divide that exists between socio-economic groups within a country.

International Divide: The digital divide that exists between countries.

Smart Card: A smart card looks like a plastic credit card and has a microprocessor or memory chip embedded in it. The chip stores electronic data and programs that are protected by security measures enabling controlled access by appropriate users. Smart cards provide data portability, security, convenience, and transparency of financial records and transactions.

Telecenter: Shared site that provides public access to ICT.

Teledensity: The number of telephone mainlines per 1,000 people.

Universal Access: Provision of ICT services to all of a country's households through shared facilities.

Universal Service: Provision of ICT services to all of a country's households within their homes.

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Preparing African Higher Education Faculty in Technology

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INTRODUCTION

One of the most difficult challenges facing African higher education institutions (HEIs) is the successful resolution of the inherent tension that underlines efficient and effective utilization of existing resources on one hand and intensified demand for more and better education on the other (Okuni, 2001; Sawyerr, 2004). Although the potential of information and communication technologies (ICTs) to enhance participation in African HEIs has been widely recognized, its transformational capacity has barely been reached because of limited infrastructure, technological capacity, funding and sustainability of resources, and human resources and expertise. Poor infrastructure and weak regulatory policies and frameworks have resulted in inadequate access to affordable telephones, broadcasting, computers, and the Internet (Johnson, 2002).

For many countries, the uneven use of ICT presents the equity dilemma, where the gap between the information-rich and information-poor further marginalizes disadvantaged groups, inadvertently widening the digital divide (Dunne & Sayed, 2002). Statistics by African Internet Connectivity (2002), for example, indicates that although all African countries have Internet connectivity, there are only about four million Internet users. A report by the Association of African Universities (2002) indicates that ICT in African HEIs is limited and varied. Consequently, the benefits of ICT are not being fully realized due to factors such as struggling economies and rising enrollment.

Despite policy pronouncements, the status of ICT shows that the continent is at a growing disadvantage with respect to the global information and technological revolution (Association of African Universities, 2000). Meanwhile, educators are expected to be at the forefront, helping to plan and develop national and international systems that facilitate rapid dissemination of information while simultaneously keeping current with the literature in their various academic disciplines.

BACKGROUND

Two features characterize higher education in Africa. First, until the 1960s, HEIs consumed few public resources, because they were not central to the economic needs of the society. As countries achieved independence, higher education expanded as a symbol of autonomy and autarchic development. The second feature was the major response of higher education to social and economic change has been curricular change. As noted by Dunne and Sayed (2002) and Sawyerr (2004), the 1970s witnessed growing cynicism and skepticism that replaced the initial optimism about higher education development. By the 1980s, it was clear that while substantial progress was being made, it was evident that higher education was in need of change. The proposed changes harnessed the potential of ICT and faculty development to improve access, quality, and efficiency of higher education.

The massification of higher education is now associated with increased access for those who have been previously excluded (Dunne & Sayed, 2002). HEIs have invariably been cast in the role of producing skilled human capital, coupled with the responsibility of acting as catalyst in the search for quality and relevance in terms of teaching, research, and service (Seddoh, 2003). Paradoxically, during the transition, higher education has been characterized by increased competition and decreased funding, and slow rates of economic development have contributed to the perception that HEIs are not making significant economic and social contributions. Faced by financial constraints, African governments question investing in higher education, and donor agencies primarily focus on primary education. The following is an overview of the state of ICT in African HEIs in relation to challenges and opportunities. The importance of decision making in the selection and implementation of ICT in higher education is discussed, followed by a discussion of techniques that are useful in preparing faculty to use ICT. Recommendations and the future of ICT are also presented.

TECHNOLOGY INTEGRATION IN HIGHER EDUCATION

The goal of higher education is to expand educational opportunities, seek pedagogical alternatives, and accommodate new theoretical assumptions that potentially enhance teaching and learning (Minishi-Majanja, 2003). While not everyone agrees with the assumption that technology-enhanced instruction is a viable method of delivery, experimenting with new modes of delivery has been one of the means of accommodating enrollment pressures. When ICT are well-implemented and utilized, they can add new resources to existing course content in the learning environment and introduce unique options for teaching and learning.

Access to the Internet offers users the possibility of interaction that transcends the boundaries of time and space, enhances the range of information available to learners, and expands the opportunities for international communication (Donat, 2001; Minishi-Majanja, 2003). Distance education, open learning, and e-learning have all made considerable use of various resources, such as Web-based and Web-enhanced learning. Many of these include satellite links, computers, telephone conferencing, fax, and interactive video. Donat (2001) and Okuni (2000) present the case of the African Virtual University based in Kenya as an example of a first attempt to use on a large-scale various ICT to meet the growing demand for access to quality higher education throughout the continent. Bhalalusesa (1999) and Minishi-Majanja (2003) also present examples of the Open University of Tanzania and the University of South Africa as HEIs that have also been providing quicker and more effective access to higher education in the continent. The University of Ghana also has increased use of the preexisting External Degree Centers (Sawyerr, 2004).

One goal of technology integration is to reach new levels of productivity, but several barriers can obstruct the process. These barriers include the characteristics of the adopter and the organization, the innovation itself, communication, institutional culture, barriers in organizational structures, access to the innovation, and autonomy to implement the innovation (Rogers, 1995; Surry & Land, 2000). Hence, administrators seeking to institute rapid change must consider three issues: First, a percentage of the faculty may resist change. Second, a variety of strategies are needed to address the needs of individuals with differing rates of innovativeness. Third, the strategies should be ongoing over the life cycle of the innovation (Bennett & Bennett, 2003; Surry & Land, 2000).

Ely (1990, 1999) identified eight conditions that should be present when implementing, planning, and monitoring educational technologies: (1) dissatisfaction exists with the status quo; (2) knowledge and skills exist for the implementers; (3) resources are available and accessible; (4) time to learn and integrate technology is available; (5) rewards or incentives are available; (6) participation is expected and encouraged; (7) commitment exists at all levels; and (8) good leadership is evident. The important questions to ask are, "How many of the conditions currently exist?" and "Which conditions require improvement to help in our situation?"

Several setbacks occur when HEIs invest in technology for political and commercial purposes, or without adequate funding to maintain efficiency of operations. First, technology policies are not coordinated with availability of resources, supporting infrastructures, and training. Second, ICT are introduced without adequate understanding of the organizational culture and context, or the political, physical, economic, social, and technological environment. Third, ICT are introduced hastily and arbitrarily in a top-down manner. To maximize the benefits of ICT, they should be viewed as a set of tools for solving specific problems, and not as a universal remedy for all educational challenges. In these circumstances, technology plans should establish explicit connections between the proposed physical infrastructure of the ICT and instructional and professional development strategies needed in addition to evaluation processes that monitor progress. Above all, decisions should be made about whether adoption of ICT is a priority of the HEI and what resources they are willing to invest in.

The importance of faculty support and training to the success of technology in instruction has been widely acknowledged in higher education (Bennett & Bennett, 2003; Erasmus, 2002; Wanzare & Ward, 2000). While many studies have primarily focused on program design, evaluation, and logistics, there is still a need to investigate the effectiveness of these activities. However, no study has yet fully documented the expertise among educators in African HEIs despite ICT being demanded as a means of ensuring that the few resources available are used optimally (Minishi-Majanja, 2003).

Many faculty have received little or no explicit training in how to teach, or in the theories and processes of teaching, yet they are responsible for teaching learners who are expected to master a large knowledge base or to perform a broad variety of procedures (Fourie & Alt, 2000; Wanzare & Ward, 2000). Erasmus discussed the importance of performing needs assessment before initiating a faculty development program. The needs assessment should be followed up with frequent reviews to highlight the progress made and areas to be addressed. It should also focus on proficiency in ICT applications, the ability to adapt to new teaching styles and ability to adapt to instructional environments that may be more demanding and time consuming.

While one aspect of developing technological expertise involves mastering the skills required to use various software and programs, an equally time-intensive task includes translating those skills to specific curriculum content (Fourie & Alt, 2000). Instructors who use technology in instruction are often chosen based not on their personality, motivation, and teaching style, but on the subject matter of the course. Research also indicates that faculty are motivated, interested, and have positive attitudes toward the use of instructional consultation on a personal basis but not by coercion (Bennett & Bennett, 2003; Rups, 2003). To increase motivation, Minishi-Majanja (2003) recommends academic rewards and entrepreneurial benefits, especially in respect to intellectual property ownership for their course content.

The competencies necessary for the development and training of effective educators and found that issues include the introduction of new curriculum with little training and development afforded to educators and the promotion of personnel who lack experience and managerial skills. One challenge of faculty development is to break the barrier of unfamiliarity with and phobia of computers. Another challenge is to help faculty grasp instructional techniques that are specific to the technology-enhanced environment, while at the same time respecting and building upon their experience in the traditional classroom.

Faculty development is more effective when participants set their own goals, plan their own learning, use experiential learning, and evaluate outcomes in terms of achievement of their own goals. Thus, it is important to provide participants with opportunities to improve their skills and make the personal rewards of teaching more compelling (Bennett & Bennett, 2003; King & Fawley, 2003; Minishi-Majanja, 2003; Rups, 2003). Faculty development programs not only hold the possibility of helping educators learn to use technology but also provide forums for them to share their questions and solutions and to discover alternatives together (King & Lawler, 2003).

HEIs are faced with the task of incorporating and increasing ICT usage so as to be relevant, visible, and competitive. At a time of crisis and scarce resources, HEIs must be effective, efficient, and enhanced by administration that focuses on faculty development, the infrastructure, and equipment. Thus, shared vision, attitudes, clearly defined and communicated policies, goals, and objectives are important in ICT implementation, development, and utilization (Seddoh, 2003).

FUTURE TRENDS

Rapid changes in ICT are inescapable, and the globalization imperative requires potential role players not only to possess requisite ICT skills but also to have regular access to corresponding facilities. Technology is crossing borders and continents, offering opportunities to pool knowledge resources for sustainable global development. While the digital divide in higher education can be bridged, it requires tolerance, patience, and adequate, well-targeted resources for capacity building, connectivity, and access to broaden participation and awareness (Johnson, 2002). Notwithstanding the potential benefits of ICT, access to higher education, computing, and communication technology resources remains one of the great challenges that makes it increasingly difficult for educators and learners to keep abreast of current developments in their fields.

There are several guiding questions that should be addressed when planning ICT programs. The question posed for the administrator is: How can I assist faculty to integrate new technologies in instruction? The questions posed for faculty intending to adopt new technologies are: Which instructional applications of technology are easy enough to use and helpful to myself and my learners? How much will I have to change the way I teach? There, ICT adoption and faculty development programs should specify objectives and how they relate to professional activities, because programs that are mandatory or inflexible are likely to be unsuccessful. The programs should also be task centered, with an immediacy of application (King & Lawler, 2003).

Many institutions are at various stages of planning and infrastructural development, and case studies are underway to document and analyze the experiences of selected HEIs so as to draw out lessons and best practices, as well as to identify potential pitfalls (Sawyerr, 2004). Continued collaboration is recommended especially for HEIs that have limited financial resources or are in the initial stages of technology adoption. Collaborative initiatives are particularly significant, because networking, which is the backbone of effective harnessing of ICT, often transcends departmental, institutional, and national jurisdictions. Some of the areas of collaboration include finance and budgeting, selecting hardware and software, instructional development, implementation of programs, administration of ICT projects, and faculty development (Minishi-Majanja, 2003).

While administrators cannot force improvement, it is important for them to provide opportunities and environments that free faculty to attend training programs. Providing release time for training, for instance, demonstrates the value that the administration places on providing meaningful incentives, long-term achievement, and opportunities to improve the quality of instruction. To attain success, HEIs must find connections between curriculum, pedagogy, technology, and administration. They should also address how, when, and what types of

technology would most benefit the instructional situation.

CONCLUSION

Because little is known about the effectiveness of different types of pedagogical approaches in African higher education, it would be useful to investigate the pedagogical and technological issues that are unique to higher education, with an aim of building models and programs for improving instruction. Although most public higher education institutions have often been constrained by lack of finance and human resources, if well implemented and maintained, it is likely that ICT will continue to be used to strengthen higher education. Continued support in these areas of research is important in order to investigate technological needs from both an intra- and an interinstitutional perspective.

The proliferation of ICT forces users to rethink how they use technology in their work, whether in instructional development, planning, gathering information, or communicating. Technology certainly facilitates communication, but it is also a cause for reflection and dialogue to encourage and empower educators to capture its greatest potential. In a knowledge age, successful societies will be those that effectively and efficiently integrate ICT with teaching and learning. Technology should be seen as a tool for reform, where a new vision of technical cooperation can be used to create a new development paradigm and provide the potential tools for building sustainable capacity.

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KEY TERMS

Digital Divide: The disparity in the access to and effective use of computers, the Internet, and technology. The term is defined in terms of ethnic groups, household income and composition, age, gender, and geographic location.

Distance Education: Print-based and electronic learning resources used to connect learners, resources, and educators, where the learning group is separated by time or geographical distance.

E-Learning: Instruction that covers a wide set of applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of instructional content via Internet, intranet/extranet, audio- and video-tape, satellite, and CD-ROM. However, many organizations only consider it as a network-enabled transfer of skills and knowledge.

Educational Technology: Systematic identification, development, organization, or utilization of educational resources and the management of these processes. The term is occasionally used in a more limited sense to describe the use of multimedia technologies or audiovisual aids as tools to enhance the teaching and learning process.

Faculty Development: A purposeful, institutionalized approach to doing that which helps faculty do their work better as individuals within an institution and within the collective enterprise of higher education.

Instructional Development: The development of learner, instructor, and management materials (both print and nonprint) that incorporates specifications for an effective, efficient, and relevant learner environment. Instructional development includes formative and summative evaluation of the instructional product.

Needs Assessment: Problem identification process that looks at the difference between "what is" and "what should be" for a particular situation. It is an analysis that studies the needs of a specific group, such as employees or learners, and presents the results detailing those needs, for example, training needs and resources needs. Needs assessment also identifies the actions required to fulfill these needs, for the purpose of program development and implementation.

Open Education or Open Learning: Any scheme of education or training that seeks systematically removes one or more barriers to learning. It also means learning in your own time at your own pace and at your own base, using higher education settings for academic assistance and as a base for facilities and equipment. Formats include distance learning and online learning.

Web-Assisted Instruction: A course that uses the Internet to provide a significant amount of course content on the Web to learners outside of class time. Materials may be supplemental in nature or provide content in an alternative form that may be viewed at the learner's convenience. Learners interact with other learners outside of class through e-mail, message boards, or chat.

Web-Based Instruction or Online Instruction: Courses or programs mediated by computers where instructional material is delivered via the World Wide Web. Instruction that is solely delivered through the Internet using message boards, electronic drop boxes, or e-mail attachments to the instructor. Interaction occurs via e-mail, message boards, chats, or conferencing programs. WBI often utilizes the multimedia capacity of the technology.

Problem–Based Learning and the Design of E–Learning Environments

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INTRODUCTION

There is tremendous pressure today for faculty in academic environments to use Web-based technologies to deliver online instruction. One reason for such pressure comes from the fact that technology can be an effective tool to deliver online instruction. Regardless of the reason, too often the pressure results in using Web technologies as classroom management tools, such as for e-mail, attendance, and posting syllabi, rather than as an effective online curriculum tool to deliver instruction for courses. These online courses have become known as e-learning, which in its strictest sense covers training, teaching, and learning programs that use networked technologies as the medium of choice to deliver instruction. Unfortunately, a great majority of e-learning sites are designed and developed without much regard for applying pedagogy. The most fundamental step in the design and development of effective e-learning environments is the recognition that they must be based on an effective pedagogical model.

There are numerous pedagogical models that have been applied to develop e-learning sites (Gillani, 2003). However, with the explosion of the Web as a medium of delivering instruction, problem-based learning that is based on a constructivist pedagogical model is beginning to become popular as an effective model for delivering instruction online. Problem-based learning (PBL) is an approach to teaching where learning results from working with a presented problem. A PBL model can be defined as an instructional strategy in which students are confronted with real-world problems and are supported in carrying out research to find meaningful solutions. There are good reasons for PBL to become a popular model for developing e-learning applications.

First, it is the matter of timing. We have known for several years that if we can adapt new instructional techniques to the Web, it can be an effective tool to transform the learning process to meet the challenges of education-on-demand. PBL is the right response for the Web to be the tool of choice to deliver instructional objectives. The Web was initially used instructionally by simply pasting traditional text-based materials without much regards to pedagogy. Many students under this

approach simply memorized the pasted material on the Web just to pass the test. Then, within a few months after the test, students either forgot their knowledge or could not apply their knowledge in real-life situations. However, if the PBL model is applied to the design of Web sites, students' attitudes toward learning are changed, and they learn better and retain new knowledge more readily. Furthermore, PBL not only enhances instruction, it is also instrumental for students to learn how to learn for life.

Another reason why application of PBL to the design of e-learning can be successful is because it is similar to the way scientists and adults learn. Gwendie Camp (1996) cites Knowles who has proposed the following criteria for an effective condition of learning:

...a learning environment characterized by physical comfort, mutual trust and respect, mutual helpfulness, freedom of expression, accepting of differences, where learners perceive the goals of the learning experience to be their own goals, where learners accept a share of responsibility for planning and operating the learning experience and therefore have a commitment to it, where learners participate actively, and sense progress toward their own goals. Adults feel a need to learn when the learning process relates to and uses their own experiences. (Camp, 1996, p. 1)

Learning on the Web is not any different from learning in a traditional classroom environment for adults. A PBL approach to designing e-learning environments to educate students supports all the above criteria proposed by Knowles for effective learning.

ORIGINS OF PROBLEM-BASED LEARNING

The origin of problem-based learning can be traced back to the writing of scholars like Dewey (1916), Vygotsky (1978), and Piaget (1952, 1964). John Dewey, one of the first American educational philosophers, believed that teachers should teach to students' natural instincts. Dewey believed that students will learn by doing something. He wrote,

Methods which are permanently successful in formal education ... go back to the type of situation which causes reflection out of school in ordinary life. They give pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking, or the intentional noting of connections; learning naturally results. (Dewey, 1916, p. 154)

Another influential scholar whose writing has been instrumental in the development of the problem-based approach is Vygotsky. He believed in the social formation of the mind, and he claimed that all higher human functions develop at two levels: the social plane and the psychological plane.

Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological), and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relations between human individuals. (Vygotsky, 1978, p. 57)

Vygotsky introduced the zone of proximal development to explain the dynamic relationship between learning and how development is transformed from the interpsychological level to the intrapsychological. He defines the zone of proximal development as "the distance between the actual developmental level as determined by individual problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978, p. 86). Vygotsky's theory influenced scholars such as Schumann (1962) to develop PBL as an instructional method.

Yet another scholar who influenced the development of PBL is Jean Piaget. Piaget himself was never involved in the design of pedagogical models, however, he viewed learning as a dynamic process where learners construct their own knowledge by interacting with the world. The role of teachers, Piaget believed, is not to impose steps, procedures, and rigid structure, rather they should be the architects for learning environments that facilitate a process in which students would be able to construct their own knowledge.

These three scholars influenced a historical movement in the US that has become known as the constructivist movement. The constructivist movement in the US impacted instructional design, teaching models, and educational technology. Constructivism assumes that "knowledge" is not an absolute but is "constructed" by the learner based on previous knowledge and overall views of

the world. The main impact of constructivism can be seen mostly in inquiry-training models. Schumann (1962), who was obviously influenced by Piaget and possibly by the writing of John Dewey and Vygotsky, introduced the inquiry-training model as a pedagogical tool to the design of curriculum. The inquiry-training model is a structured teaching model that allows individuals to learn the way scientists learn. Such a model follows specific phases of instruction that include solving a real problem by making hypotheses, gathering and organizing data, and testing different hypotheses to come up with a possible solution in dealing with the problem.

The evolution of the inquiry-training model during the 1960's culminated in a new approach that we call problem-based learning. The most widely implemented use of PBL was first in medical schools. From its origin at McMaster University, Canada's most innovative medical doctoral university, PBL was gradually adopted by other medical schools, and its application continued to increase through the 1970s and 1980s. Now, however, we are seeing an explosion in the use of PBL in its various adaptations. Today, adoption of PBL as a teaching and learning strategy is becoming popular by the faculty of various departments at major universities. In recent years, K-12 educators have also been using PBL to teach a variety of curriculum.

THE STAGES OF A PROBLEM-BASED LEARNING MODEL

PBL has three basic characteristics that include presenting a problem, providing resources for research, and scaffolding students to test their solution to the problem. There is no set agreement with educators who use PBL about the syntax or order of presenting the problem and the process students need to go through in order to solve the problem. PBL begins with presenting a realistic problem that students can recognize and understand. It then proceeds with students working together to determine the key issues and then solving the problem under the supportive guidance of the teachers. This process is especially true when PBL is applied to using the Web as a medium of delivering instruction. However, in order to have guidelines for the sequence of instruction for the Web, I have found that the following syntax works effectively for the Web:

- **Problem:** Present a problem situation that is messy, authentic and is likely to occur in real life.
- **Design Specification:** Specify the goals that students need to achieve. These goals may include

curriculum goals, design goals, and target audience goals.

- **Problem Statement:** Facilitate the discussion for each group so that the group will come up with a problem statement and a planning process for solving the problem.
- **Collaboration:** Group discussion, as it relates to devising a problem statement and the planning process, can be physical and virtual by using chat rooms, threaded discussion, e-mail, video conferencing, and so forth.
- **Research:** Each member of the group who has been assigned a role should carry out independent research as it relates to the planning process for funding a solution to the problem. The research in this step includes searching Web sites, finding information in the library, reading related books and journals, and so forth.
- **Design:** Provide sufficient time for the research to be completed. Bring the group back together to discuss the problem in light of the information discovered by the individuals in the group. The group will finalize the tasks that best fit the solution to the original problem. Again, this group discussion can be both physical and virtual.
- **Develop:** Finally, the group develops a reporting mechanism to present their solution. This may take the form of a Web site, PowerPoint presentation, written report, or acting out the solution.

APPLICATION OF PBL TO THE DESIGN OF E-LEARNING ENVIRONMENTS

To determine the effect of PBL, as described previously, I developed a graduate course for Math, Science, and Technology. This course was offered in the winter of 2004 to a group of 15 students who were completing their studies in the Educational Technology Leadership graduate program at the California State University, Hayward. The underlying philosophy of this course was that people learn better when engaged in making and designing their own meaningful projects, therefore, students were expected to become designers of curriculum using technological tools. In addition to learning about mathematics, science and technology, students studied problem-based learning and authoring technology such as Macromedia Flash, Dreamweaver, and FireWorks to develop e-learning sites that were related to math and science.

In what follows, I will briefly describe one of the assignments for this class that used a PBL approach for graduate students to design and develop an e-learning site

for young elementary school students who were to learn about basic geometric shapes. Please, note that these graduate students were familiar with authoring tools such as Flash and HTML. The course has its own Web site, however, for this particular assignment, I decided to use Blackboard to reflect the syntax of PBL and for the students to become familiar with Blackboard.

Blackboard is a flexible online delivery tool that allows the user to personalize its menu items and the functions each menu item supports. Blackboard also possesses other instructional features, such as chat rooms, forum, virtual office, and so forth, that can be embedded into the design and development of online instruction. The flexibility of Blackboard allows one to design and develop it as an appropriate instructional delivery medium applying the PBL model to create educational environments that encourage and sometimes force students to follow a specific teaching model for effective instruction. Figure 1 shows the main page for this assignment.

As it is illustrated in Figure 1, the menu items on the left side reflect the phases of PBL. The first item, *Information,* simply explains what the assignment is and the features that a PBL e-learning site should follow. Prior to this assignment, I had spent some time in one of my lectures giving an introduction about PBL to my graduate students, therefore, students were familiar with the concept. Furthermore, since the graduate students were supposed to design and develop an e-learning site, I had spent time explaining the process that professional Web developers undertake when they want to design and develop a Web site. In fact, the Web design process I had chosen was taken from an IBM site that recommends specific steps in the design of Web pages.

Figure 1. First assignment for the graduate course of math, science, and technology
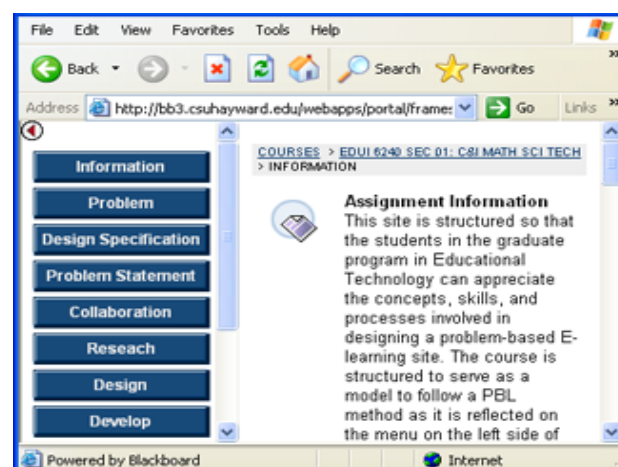
The second menu item, *Problem*, as shown in Figure 1, represents the first phase of PBL, which is to present to the graduate students a real-world problem that is easily understood and recognized. The problem simply states that

Ms. Roya Gillani, a second grade teacher in NewAge School District, has noticed that legends as symbols on maps are a very difficult concept to identify for Special Ed and younger students in elementary school. She has reported that it is difficult for her students to look at the box with the legend, read what each represents, and then find the same shape on the map. The difficulty is especially true if there is a similarity of shapes: for instance, half a circle, a colored circle, and an empty circle. The School District is calling for a proposal to solve this problem. If you are interested, please click on the Design Specification *to get more information.*

The graduate students in my class were grouped into three groups of five to virtually collaborate with each other to solve this problem. Before attempting to solve the problem, the members of each group were encouraged to click on the *Design Specification* which is the third menu item in Figure 1. The *Design Specification* provides a detailed explanation of the goals for the e-learning site. The following information is a summary of the *Design Specification* for each group:

Based on the recommendation of the teacher, the NewAge School District is implementing a call for proposals for an e-learning site dealing with geometric shapes so that students can easily identify the legends on a map. You have been assigned to design and develop a Web site that will teach Ms. Gillani's students to identify geometric shapes. Please, read the following Design Specification *that includes curriculum goal, user goals, educational goals, and team members. Then click on* Problem Statement *in the menu on the left to collaborate virtually to write a problem statement and assign roles to your team members.*

The next step after reading about the design specification is to develop a problem statement. As it is shown in Figure 1, the fourth menu from the top is the *Problem Statement*. When the graduate students click on this menu item, it will guide them in how to develop a problem statement.

Students in each group are invited to use the collaborative tools to develop their problem statement and to plan their research process to find information about designing an e-learning site that would solve the initial problem. The fifth menu item as shown in Figure 1, *Collaboration*,

provides access to a variety of online tools. It should be mentioned the site was designed in such a way that only members of each group had access to their own tools. Their discussion and information were not shared with members of other groups. Obviously, the professor had access to all groups' discussions to provide supportive assistance. The collaborative tools that students in each group had access to are:

- Announcement;
- E-mail (All Users, All Groups, All Teaching Assistants, All Instructors, All Observers, Select Users, Select Groups, Select Observers);
- Collaboration (Virtual classroom, and Chat room, Whiteboard);
- Group pages (numbers vary);
- Discussion board (numbers vary).

The next step in the process of PBL calls for individual members of each group to carry out their research. As shown in Figure 1, the sixth menu item *Research* from the top links the graduate students to their research area. Remember that individuals in each group were assigned to have specific roles in the process designing the e-learning site. These roles include interface designer, site architect, content specialist, PBL specialist, and programmer. Depending on the role of each member of the group, the *Research* areas were organized to have appropriate links to Web sites, books, article, CD-ROMs, and PDF files. These files and links provided specific information that was appropriate for the roles they had accepted.

As shown in Figure 1, the seventh menu item from the top is *Design*, which is the next phase of instruction in PBL. In this phase students will bring the results of their research back to the group. Here again students have access to all the collaborative tools that were stated previously. The members of each group will use these tools to virtually share their research and to story board their design process for developing their e-learning site. The tasks for the graduate students in this phase included:

- Specify young students' behavior as they would use the e-learning site. Flowchart the possibilities of presentation and the content organization.
- Design your navigational system.
- Design interface for each page of the site. Please remember to use a similar page layout for a consistent look.
- Decide on types of media you may use.
- Assign tasks for individual members of your team to use Web technologies to develop the e-learning site.

The last step in the process of developing the e-learning site that will teach Ms. Gillani's students how to recognize geometric shapes is development of an appropriate e-learning site. Here students will story board what was created in the previous phase and use appropriate technologies such as Flash, Dreamweaver, HTML, and FireWorks to collaborate with one another to develop the e-learning site. Note that in this step, a hierarchy of file share capability was created to ease the development of the site. In the previous step, each member of the group was given a specific assignment to complete. The sum of all the assignments would create the complete e-learning site that Ms. Gillani would need. As students develop their assignments, they will FTP their finished product in specific files. When the entire files are done appropriately, they can then place their entire file system on a server. The URL would be given to Ms. Gillani so that she can ask her students to use the e-learning site to learn how to recognize geometric shapes in legends.

CONCLUSION

The graduate students in my course have all completed their assignments and placed them on the server. They reported that their PBL learning environment for developing an e-learning site was stimulating and refreshing. They also have reported to me that they have now mastered the process of planning and developing an e-learning site. The planning processes that I have implemented for a PBL assignment were taken from the process that IBM uses to develop large professional Web sites. My graduate students have reported that they were more motivated because they were actively involved in the process of developing the e-learning site. Most important, all the graduate students have told me that they have mastered the process of PBL using a real-world problem as their guiding principle. They have requested that for their next assignment that they follow a PBL model to develop another PBL e-learning site.

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KEY TERMS

Chat Rooms: In online chat meetings, people come together, in real time over long distances, by typing on their computers. All comments are recorded on screen so that participants can view what has been discussed.

Constructivism: Constructivist educators argued that children must continually reconstruct their own knowledge through active reflection on objects and events until they eventually achieve an adult perspective.

E-Learning: In its strictest sense, e-learning covers training, teaching, and learning programs that use networked technologies as the medium of choice to deliver instruction.

File Transfer Protocol (FTP): An application and network protocol for transferring files between host computers. Such a protocol allows users to quickly transfer text and binary files to and from a distant or local PC.

Inquiry Training: A structured teaching model that allows individuals to learn the way scientists learn. Such a model follows specific phases of instruction that include solving a real problem by making hypotheses, gathering and organizing data, and testing different hypotheses to come up with a possible solution in dealing with a problem.

Online Collaborative Tools: A series of online tools such as e-mail, forum, chat room, and whiteboard that allow users to communicate and collaborate with one another.

Online Instruction: A method of teaching that employs networked technologies to deliver instruction.

P

Problem-Based Learning: An approach to learning based on cognitively-based learning theories in which teachers encourage students to learn by actively engaging them in instructional strategies that focus on problem-solving and the knowledge is developed as a consequence of trying to solve the problem.

Video Conferencing: This technology allows people in two or more distance locations to speak with each other simultaneously. It allows users to discuss ideas when face-to-face interaction is desired but not possible.

Producing and Sharing Free Advanced Scientific and Technological Knowledge Using the Internet

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INTRODUCTION

During 1998-2000, the UK published 4,729 scientific articles per million inhabitants, the Czech Republic published only 1,401 and Turkey 278 (Sandelin & Sarafoglou, 2003). Each year, researchers produce about 2,000,000 refereed articles for 20,000 scientific journals (Harnad, 2003), the huge majority of them being printed in western countries. The contribution of developing countries to these publications is marginal. In 2000 India published less than 2% of world scientific articles. China's share was about 3% and Brazil 1% (OST, 2004).

The importance of education, research and innovation for economic growth is well known at least since Schumpeter (1912). According to Jones (2000), between 1965 and 1990, 35% of the U.S. growth can be attributable to the rise in educational attainment and 40% can be attributable to the rise in worldwide research intensity. From the 1980s, researches and investments in ICT have played a leading role in productivity growth (OECD, 2003). Most developing countries have been unable to be part of this movement, and the tremendous education and research gap between advanced and developing countries has never ceased to

Chart 1. Gross enrollment ratio in tertiary education 2000/2001 (Source: UNESCO)

expand. Chart 1 summarizes this gap in tertiary education and Table 1 shows that research and development (R&D) expenditures as well as ICT diffusion are strongly correlated to wealth (GDI per capita).

The access to scientific information is a fundamental prerequisite for scientific development. Even though scientific knowledge is not only cumulative (Kuhn, 1970), information sharing is the heart of scientific progress. Like Isaac Newton, contemporary researchers are standing "on the shoulders of giants." Nowadays, this knowledge is mainly spread through scientific journals. These highly specialized publications are very expensive and their cost has tremendously increased over the last years. The median cost of serials is now three times higher than it was in the mid-eighties (Table 2).

The cost of scientific journals is now so high that even wealthy institutions often cannot afford access to many important scholarly publications. In 1999, Yale University had an acquisition budget of about 10 million US$; Harvard had about 17 million US$ and the (relatively low) global acquisition budget for French universities was about 63 million US$ (Chartron & Salaun, 2000) quite equivalent to Peru's total R&D expenditures. In this context, the scientific information access gap between advanced and developing countries seems to be insurmountable.

The Internet is a ground-breaking technology to share information. It allows instantaneous diffusion at a very low cost. We will see that it can become a powerful tool to help developing countries reducing the information gap. The first section will introduce the open access movement. The second section will present the ways scientific information diffusion through the Internet can contribute to developing communities.
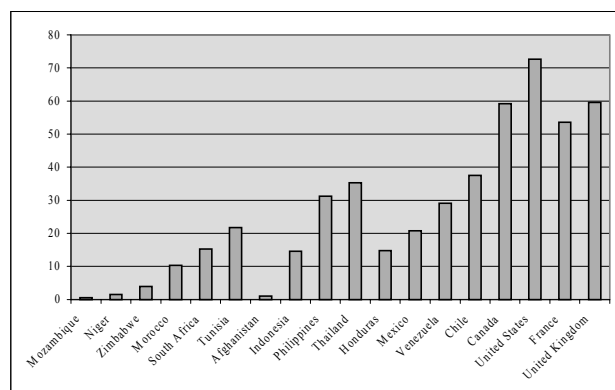
INTERNET AND OPEN ACCESS TO SCIENTIFIC INFORMATION

There is now a growing debate on the cost of academic journals and on free access to scientific information. The question here is not to discuss the justifications for these prices (see discussion in Odlyzko, 1998), but to

Table 1. Selected R&D and ICT indicators, 2001 ([a]Japan excluded. Compiled from selected UNESCO and World Bank data.)

	Countries	Researchers per million inhabitants	Expenditure for R&D in million of US$	Expenditure for R&D as % of GDI	Personal Computers per 1,000 people	Internet users per 1,000 people	GDI per capita (2002)
Africa	7	104	1 350	0.34	23	20	1 000
South and Central America	13	221	9 000	0.34	62	53	3 000
Eastern Europe	14	1 634	8 000	0.79	55	49	3 500
Asia[a]	11	1 211	30 500	0.75	30	48	5 500
Oceania	2	2 818	7 000	1.28	495	353	16 000
Western Europe	17	3 142	180 000	2.04	315	327	23 500
North America	2	3 538	305 000	2.37	609	489	29 000

insist on the specificity of scientific publications where authors do not aim at making financial profit. Researchers publish to popularize their works and to improve peer recognition (which has a great impact on their careers). They are "giveaway authors" (Harnad, 2001) and do not receive any royalties or fees.

The conflict of interest between researchers and publishers is quickly increasing since the exploding prices of academic journals strongly reduce the diffusion of scientific works. In the Gutenberg Era there was no alternative, publishers were the only way to reach readers. In the Post-Gutenberg Era, digital networks offer a powerful alternative which can lead in the long term to a new organization of scientific publications (Harnad, 1999). Preserving quality controls and certifications through peer-review, this organization should be based on open access to electronic publications.

Over the last years, the development of the Internet and the growing conflict between researchers and publishers gave rise to an accelerated development of the practice of open access. Beginning with repositories and self-archiving, it is now moving towards free electronic publications.

Repositories

From the very beginning, scientists have exchanged information, consulted peers about a given idea or tested colleagues reactions to an innovative concept. Up to the second half of last century, the main transmission tool was private correspondence via postal mail. With the

development of the Internet and electronic communications, informal exchanges have exploded:

- It is now easy and very common to contact a researcher by e-mail to ask him for a copy of a given work.
- In order to increase their visibility, many researchers use the Internet for a long time to self-archive their works and to make either pre-prints (before refereeing) or post-prints (after refereeing) available on their own Web site.

Considering the success of these informal exchanges, Paul Ginsparg, a physicist at the Los Alamos National Laboratory, initiated in 1991 the *arXiv* archives (http://www.arXiv.org). The objective was to centralize and ease access to free electronic publications. Researchers are asked to directly archive their work in the repository. With such tools, publications are not dispersed among many Web sites and are immediately available. There are now more than 300,000 articles in *arXiv* with a submission rate of about 3,500 papers per month.

Following this pioneer, other high-level archives emerged. The two most famous being *Cogprints* (http://cogprints.ecs.soton.ac.uk) specialized in cognitive sciences and *PubMed Central* (http://www.pubmedcentral.gov/) in life sciences. More specific projects have also been implemented like *Bioline Eprints Archives* (http://bioline.utsc.utoronto.ca/), which specifically aims at increasing visibility and providing open access to research publications from developing countries.

Table 2. Evolution of the median value of serial unit cost, 1986-2003 (Source: Association of Research Libraries)

Year	Serial Unit Cost	Annual percentage changes	Cumulative percentage changes
1986	$ 89.77	N/A	N/A
1988	$ 117.25	10.94%	30.60%
1990	$ 134.09	4.18%	49.36%
1992	$ 173.67	13.93%	93.46%
1994	$ 200.85	6.67%	123.72%
1996	$ 222.89	3.95%	148.28%
1998	$ 245.05	-1.97%	172.96%
2000	$ 303.19	12.30%	237.73%
2001	$ 282.54	-6.81%	214.72%
2002	$ 296.50	4.94%	230.27%
2003	$ 283.08	-4.53%	215.32%

The development of repositories and self-archives has led to a standardization need. The only way to find works stored in different repositories is to standardize the way these articles are identified. This observation is at the origin of the *Open Archives Initiative* (http://www.openarchives.org) initiated by Ginsparg in 1999 with "The Santa Fe Convention of the Open Archives Initiative." The *Open Archives Initiative* designed specific meta-data tagging standards to make open archives easily harvestable, and provides registries of OAI-compliant archives like *OAIster* (http://www.oaister.org) or *Eprints.org* (http://www.eprints.org). This initiative knows a tremendous success. In May 2005 *OAIster* managed nearly 5.4 million records from more than 470 institutions.

Electronic Publications and the Author-Pays Model

Publishers could not ignore the progress of electronic publication and distribution. Considering the quick development of knowledge dissemination through the Internet, many among them have thus decided to make their journals available online. Apart from their usual paper edition, those journals try this way to improve their diffusion and reputation.

Some publishers or institutions also decided to adopt a more radical solution: purely electronic journals. The idea is that, considering the prices of printing and postal diffusion, electronic publications can reduce the cost of journals (Walport, 2003). The publisher only has to support the organization of the review process and the cost of diffusion tools (software and hardware).

The access to the electronic articles originated from classical or electronic journals is usually reserved to subscribers, but a growing number of them are now free on certain condition (such as time-delayed release). In May 2005, the *Directory of Open Access Journals* (http://www.doaj.org) listed more than 1,500 journals in all disciplines.

The transition to electronic journals reduces the cost but is, of course, insufficient to economically validate the open access model. Apart from subsidy-based free journals, a growing economic model is based on the payment by the author's institutions. An author-pays model is substituted to the classical subscriber-pays system.

The most prestigious initiative yet is that of the *Public Library of Science* (http://www.plos.org) founded in October 2000 by Nobel Prize recipient Harold E. Varmus, Patrick O. Brown from Stanford University, and Michael Eisen from the University of California Berkeley. They received a $9 million grant from the Gordon and Betty Moore foundation and launched a high-level journal, *PLoS Biology*, in October 2003. Using an equalization system, publications in *PLoS Biology* could be affordable to any laboratory in developing countries (Delbecq, 2004).

The economic model of free publications remains to be constructed. A pure author-pays system cannot be implemented immediately. Prosser (2003) proposes a transition model where journals would present authors two options:

- To pay for publication and the article will then be freely available.
- Not to pay for publication and the article will only be available to subscribers.

According to Prosser, the numerous advantages of open access, particularly in terms of visibility and citation frequency (Harnad, 2004) should lead to a growing share of author-pays articles. The validity of this model has recently been confirmed in a study of the Wellcome Trust which shows that the author-pays model offers a viable alternative to the classical subscription system (Walport, 2004).

DEVELOPING REGIONAL COMMUNITIES AND SCIENTIFIC INFORMATION OPEN ACCESS

The evolution toward open access will contribute to scientific progress in developing countries in at least two ways. It will enlarge the available information base

and strengthen regional networks as well as regional organizations visibility.

Information Base

We have pointed out the fact that even rich universities cannot afford access to many scholarly journals. This problem is obviously far more intense for low budget institutions particularly in developing countries.

The development of free online journals, of repositories and self-archiving could allow any laboratory in the world to access to some of the most recent publications. Over a million research articles were freely available on the Web in 2001 (Lawrence, 2001) and this figure has never ceased to grow. By encouraging specific training for graduate and undergraduate students, teaching them how to access these free publications, universities in developing countries could both reduce the need of journals subscriptions and enlarge their information base.

Researchers belonging to regional communities will also benefit from these networks. Even though high-level researches will still require the acquisition of some specific works, free publications are now sufficient to do the groundwork.

Visibility and Regional Networks

The development of free journals and repositories stimulate the visibility of researchers and academic institutions (Lawrence, 2001). Regional communities are fully aware of it and are more and more involved in that movement. In South America for example, the project *Scientific Electronic Library Online* (http://www.scielo.org) is now gathering Brazil, Chile, Cuba and Spain. In Africa, the *African Journals OnLine* (http://www.ajol.info) promotes African publications and already proposes free abstracts.

Since many institutions and laboratories in developing countries are highly specialized in very specific fields like rural development, tropical diseases or agriculture, the implementation of regional repositories could promote these specific researches and give them a better visibility. The constitution of specific local networks could thus ease the development of works in fields that are considered marginal in developed countries.

Furthermore, the constitution of free access tools to local language literature would help local engineers communities to be aware of recent developments in their field and ease the elaboration of specific solutions.

Implementing a repository is technically relatively easy (Crow, 2002) and specific freely available tools have been developed to help their creation, mainly:

- *Eprints* (http://www.eprints.org) developed by Southampton University.
- *DSpace* (http://www.dspace.org) developed by MIT libraries and Hewlett-Packard.
- *CDSware* (http://cdsware.cern.ch) developed by the CERN.

Such tools allow the quick development both of specific or general repositories and of institution-based self-archiving. Specific regional repositories can then easily be implemented. Sharing the hardware costs between regional institutions could permit developing countries to create original exchange systems that would have been impossible to set-up before the Internet. Existing initiatives, like for example CARINDEX (http://www.mainlib.uwi.tt/), which indexes the content of 70 West Indian journals, or LATINDEX (http://www.latindex.org/) which promotes Latin America scholarly publications, could initiate at relatively low cost such regional repositories.

Regional institutions could also benefit from the realization of electronic journals. Such journals are cheaper than paper publications and have a greater impact. *PLoS Biology* provides a significant demonstration of the growing reputation of these journals.

International institutions and non governmental organizations working with developing countries are more and more aware of the importance of open access, and could help financing initial set-up costs. The United Nations already contributes to disseminate scientific works in developing countries with initiatives like HINARI (http://www.healthinternetwork.org/), which provides free or very low–cost, online access to the major journals in biomedical sciences to non-profit institutions in developing countries. Some non-governmental organizations like the *International Council for Science* which set up the *International Network for the Availability of Scientific Publications* (http://www.inasp.info), also give a great importance to the scientific information gap and could participate in regional electronic journals financing.

FUTURE TRENDS

Publishers, research institutions and researchers will have to imagine and construct innovative economic models (Prosser, 2003) since the movement toward open access is self-sustained. The superiority of freely available publications, in terms of visibility and citation impact, will become clearer and clearer as repositories grow. No author will want to be at disadvantage compared to peers practicing open access and the pressure to join the movement will inevitably grow.

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CONCLUSION

The development of information and communication technologies is said to increase the economic gap between developing and advanced countries. Even though this is true in many fields, it can also be used to free access to scientific knowledge.

The conjunction of the success of open access and the decreasing cost of computers and the Internet will open positive perspectives for research institutions in developing countries. If regional governments and international institutions accept the opportunity to promote this movement, the information gap between North and South could decrease over the next decade.

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KEY TERMS

Meta-Data Tagging Standards: Standard format of keywords used while self-archiving to identify, classify and retrieve the archived works.

OAI-PMH: "Open Archives Initiative Protocol for Meta-data Harvesting" provides a standard framework for meta-data harvesting.

Open Access Journal: Freely online available scholarly journal. Some of them are purely electronic journals, others are classical ones offering a free electronic version (http://www.doaj.org).

Open Archives Initiative: Initiated by the American physicist P. Grinsparg in 1999, the OAI designed meta-data tagging standards (www.openarchives.org).

Pre-Print: Scientific work before peer-review.

Post-Print: Scientific work modified after peer-review.

Public Library Of Science: Organization founded in October 2000 committed to make scientific literature a freely available resource. Nobel Prize recipient Harold E. Varmus is co-founder and Chairman of the Board of PLoS (http://www.plos.org).

Repository: Database where researchers archive their works, either pre-prints or post-prints. The Open Archives Initiative proposes standards to allow access to different repositories.

Scientific Electronic Library Online: Particularly devoted to Latin America and the Caribbean countries, SciELO promotes a model for cooperative electronic publishing of scientific journals (http://www.scielo.org).

Self-Archiving: Consists in the deposit of a researcher's works in a repository. The researcher is generally responsible for the format of the deposit and particularly for its conformance to the archive standards.

Promoting the Culture and Development of Regional Communities with Digital Libraries

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INTRODUCTION

Libraries and archives have always been major information sources for the history, culture and literature of regional communities. It is quite natural that in an increasingly electronic world, these rich collections are becoming available in digital form. Digital libraries permit local materials to be made available to a wide public, where they become a significant feature in the dissemination of regional culture (Love & Feather, 1998). Locally oriented digital libraries deal with specific communities, regions or states. The relationship is clear in this definition, published by the Washington-based Council on Library and Information Resources:

Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities. (Waters, 1998)

BACKGROUND

The Digital Library Federation Database of Public Access Collections (http://www.hti.umich.edu/cgi/b/bib/bib-idx?c=dlfcoll) lists nearly 500 North American digital libraries. The Association of Research Libraries Digital Initiatives Database (http://www.arl.org/did/index.html) also lists 500 systems from the same area. No less than 600 Canadian digital libraries have been identified (http://collections.ic.gc.ca/E/View.html). The information is generally brief, but a significant proportion of these collections focus on specific places and communities within North America. Digital services are less documented in other regions of the world but everything indicates that digital libraries in these regions also offer valuable local content.

The digital library field is firmly established as an area of study, with textbooks (Arms, 2000; Chowdhury & Chowdhury, 2003; Lesk, 1997); electronic journals from the U.S. (D-Lib Magazine: http://www.dlib.org/) and the UK (Ariadne: http://www.ariadne.ac.uk/); even encyclopedia articles (McCarthy, 2004). Digital libraries are also firmly established internationally. Beagrie (2003) reviews national digital preservation initiatives in Australia, France, the Netherlands, and the UK. Current technology permits relatively small institutions to establish digital library services.

By their nature, digital libraries attract a wider range of users than traditional services. It is necessary to travel to traditional collections, which have fixed opening hours, but digital libraries are available to a much wider population. Valuable materials from academic libraries, which the public previously had little opportunity to consult, become widely accessible when digitized. Traditional services require specific commitment, whereas digital libraries attract browsers interested in a wider range of aspects of community life. Access to traditional collections is basically by in-house catalogs, while indexes to Internet resources are widely available. The success of digital libraries comes despite the fact that only relatively small proportions of library collections have been digitized. Modern books are not generally available. Only a small percentage of non-copyright (pre-1923 in the U.S.) books and only the most important archival and photographic collections have been digitized.

This paper examines a variety of digital library services over different parts of the world to exemplify their contribution to the strengthening of regional culture. The technological basis of digital libraries is covered in a separate paper in this encyclopedia: "Digital Library Structure and Software."

SAMPLE DIGITAL LIBRARY SYSTEMS

Wales, a region which has made great efforts to maintain its unique features, has created highly relevant digital library services. Perhaps the most important Welsh site is *Gathering the Jewels: the Website for Welsh Cultural History* (http://www.gtj.org.uk/), set up by a consortium of Welsh cultural organizations, including universities, museums, libraries, and the National Library of Wales.

Access is via categories such as Neighbourhood and Community, Religion and Belief, or The Domestic Sphere. Alternate access is by keyword search or by clicking on a map of Welsh counties. A specific page offers access for schoolchildren, via "Discovery Trails." Naturally, all parts of the site are fully bilingual. Another major bilingual site is dedicated to the *Treasures of the National Library of Wales* (http://www.llgc.org.uk/drych/drych_s004.htm). The library offers digital access to many of its treasures, ranging from medieval poetry manuscripts to 18th Century watercolors, early photographs, maps and diaries.

Other regions of the United Kingdom also maintain significant digital library services. The National Library of Scotland maintains a series of fascinating collections, covering Scottish maps, 19th Century calotype pictures of Edinburgh, playbills and famous Scottish authors, from Robert Burns to J.K. Rowling (http://www.nls.uk/ digitallibrary/index.html). *SCRAN: The Scottish Cultural Resources Access Network* (http://www.scran.ac.uk/) offers over 300,000 images from museums, art galleries and archives. The system maintains specific sites on special topics, such as Robert Burns or The Union of the Crowns. Most images are within thematic collections, such as The Scottish Seaside Holiday or North Britain before 1000 A.D. Basic images are available to all users, who are encouraged to subscribe to obtain access to larger images and text.

The troubled politics of Northern Ireland, from 1968 to the present, are reflected in *CAIN: Conflict Archive on the Internet* (http://cain.ulst.ac.uk/), sponsored by the University of Ulster. Documents are presented in three categories: Background, Key events, and Key issues. The system was founded in 1996-97 with the support of the British Electronic Libraries Programme (eLib). Contributors give permission to use their materials, which have been accessed a total of more than 22 million times.

The U.S. South offers numerous examples of digital libraries with regional impact. One of the most wide-ranging systems is *Documenting the American South* from the University of North Carolina (http:// docsouth.unc.edu/index.html). This includes more than 1,200 books and manuscripts on subjects such as "First-Person Narratives of the American South," "North American Slave Narratives," "The Church in the Southern Black Community," etc. This site welcomes feedback and links to a 23-page analysis of reader reactions, which have been highly enthusiastic. Another Southern collection is *Louisiana Purchase 1803-2003*, created by Louisiana State University to commemorate the bicentennial of the incorporation of the states bordering the Mississippi into the U.S. (http://www.lib.lsu.edu/special/purchase/). This includes pamphlets, manuscripts and government documents, including much material in French, plus Teachers' Guides.

Probably the most important digital library relating to the Southern United States is a project which specifically attempts to transcend the borders of that region. The *Valley of the Shadow Project* permits detailed digital comparisons of a Northern and a Southern community during the American Civil War (http://valley.vcdh.virginia.edu/). Searchable newspapers, tax records, letters, diaries, images, maps, censuses and military rosters permit detailed comparisons between Augusta County, Virginia, and Franklin County, Pennsylvania, before, during and after the Civil War. The system was created at the University of Virginia with funding from the U.S. National Endowment of the Humanities.

More recent events in the South are focused by the *Civil Rights in Mississippi Digital Archive*, a fully searchable database of rare library and archival resources on race relations in Mississippi (http://www.lib.usm.edu/ ~spcol/crda/). Mississippi was central to the struggle for civil rights in the U.S. This project was created by The University of Southern Mississippi Libraries, Hattiesburg, which was the location in 1964 of the largest *Freedom Summer* project. Digital libraries also deal with specific events of the same period, such as the Virginia student strike documented in *Separate But Not Equal* (http:// www.library.vcu.edu/jbc/speccoll/pec01.html). In 1951, the students of an all-black high school, tired of their poor conditions, walked out, demanding facilities equal to those provided at white schools. This site includes photographs contrasting poor-quality black and comfortable white schools.

Canada has also established numerous regionally oriented digital libraries (http://collections.ic.gc.ca/E/ View.html). NSARM, the Nova Scotia Archives and Records Management (http://www.gov.ns.ca/nsarm/virtual) offers three online resources focusing on the explosion which destroyed a large part of Halifax in 1917. One exhibit describes the explosion, another, the reconstruction, while a fully searchable database lists the nearly 2,000 dead. On the other coast of Canada, *Vancouver's Golden Years* presents historical photographs from a similar period, 1900-1910 (http://collections.ic.gc.ca/ vancouver/index.html). This Vancouver Public Library's collection of 1,500 digitized photographs by Philip Timms is backed up by a biography of the photographer, and the full text of a book about him. The interface is in English. A comparable collection is available in French at Montréal: Municipalité-Métropole 1920-1960 (http://collections.ic.gc.ca/ mtl/). This collection offers over 300 historic photographs of places, personalities and municipal services, from the Montréal city archives. Some Canadian digital library services have been established in remote areas. 85 articles dealing with the Northern Territories were digitized at *Portraits du Nord* (http://collections.ic.gc.ca/nord/ index.htm). These were originally published in *l'Aquilon*,

a French-language weekly from Yellowknife (http://www.aquilon.nt.ca/). Canadian local sites can reveal significant photographic collections. The Francophone village of Plamondon, north of Edmonton, Alberta, was settled by people of mixed European and Indian race (Métis). Its site, *Plamondon en Histoire* (http://collections.ic.gc.ca/plamondon/index.html), discusses history, pioneers, etc. It also includes over 200 photographs (http://collections.ic.gc.ca/plamondon/photos/photos.html).

Further examples of interesting, regionally relevant digital libraries can be found in both small and large countries. The *Trinidad and Tobago Digital Library* (http://www.nalis.gov.tt/digitallibrary.html), created by that country's National Library, offers interesting and relevant documentation. Slave deeds have been digitized and transcribed, and there are materials relating to the famous Trinidadian cricketer and politician, Sir Learie Constantine. In Brazil, the Brazilian Institute for Scientific and Technical Information maintains a fascinating Gateway to Science and Technology in the Amazon (http://www.prossiga.br/amazonia/). This offers database-driven access to information about one of the world's last pristine regions (McCarthy & Cunha, 2003).

The former Soviet Union had a strong tradition of print-based libraries, but economic and political preoccupations since the end of communism have inhibited digital library development. Despite this, it is occasionally possible to locate relevant services. One of the most remote areas in the world, the Altai region of Siberia, is home to a major regional digital library, which operates from the city of Barnaul, south of Novosibirsk. The root site http://irbis.asu.ru (literally: snow-leopard.Altai-State-University.Russia), is dedicated to the university press, which has both traditional and electronic publications. Subsidiary materials, including photographs, maps, art works, and biographies and texts of authors related to the region can be consulted from an Altaica page at http://irbis.asu.ru/docs/altaica.html. Dostoevskii was exiled here in the 19th Century.

In Kirovograd, central Ukraine, the Regional Library (http://www.library.kr.ua/) maintains a bright modern site which includes an Electronic Reading Room with full text of books of local interest, literature, history, local government documents and bibliographies, mostly in Ukrainian, some in Russian. It is especially interesting to note that it includes Ukrainian-born personalities whose names were rarely cited in the Soviet period, such as Trotsky (http://www.library.kr.ua/elmuseum/zem/trotsky/index.html) and Madame Blavatsky (http://www.library.kr.ua/elib/ind_pokaz.html). There are also exhibitions of work by local artists, notably exuberant paintings on Ukrainian folklore themes, by Andrii Lipatov (http://www.library.kr.ua/exibit/lipatov/lipatov1.html).

Australia offers significant digital library services (Burrows, 1999; Fernandez, 2003). The State Library of New South Wales maintains beautiful, well-organized collections of locally-relevant printed materials, manuscripts, drawings, lithographs, watercolors, photographs and sheet music (http://www.sl.nsw.gov.au/online/). The presentation uses the locally developed PICMAN Pictures and Manuscripts software, which handles more than 300,000 images (http://www.nla.gov.au/libraries/digitisation/dfo05.html). Notable collections include 1,100 hand-colored postcards of Sydney and New South Wales, from the beginning of the 20th Century (http://www.sl.nsw.gov.au/online/broadhurst.cfm) and fascinating local printed ephemera, such as posters for and against enlistment during the First World War (http://image.sl.nsw.gov.au/cgi-bin/ebindshow.pl?doc=dixson/a319). A typical local feature is the disclaimer common in Australian digital libraries: "Users of PICMAN should be aware that, in some Aboriginal and Torres Strait Islander communities, seeing the names and/or images of deceased persons may cause sadness or distress, particularly to the relatives of these people" (http://www.sl.nsw.gov.au/picman/about.cfm).

Disclaimers directed towards Aboriginal communities can also be found on New Zealand sites, such as the *Timeframes* digital library from the National Library of New Zealand. This includes "items of cultural value to Mäori people and other New Zealanders. These taonga are carefully selected and carry the mana of their iwi (people) whichever medium may be represented" (http://timeframes1.natlib.govt.nz/about_timeframes.html). *Timeframes* includes 20,000 carefully indexed images, including photographs, drawings and playbills (http://timeframes1.natlib.govt.nz/nlnz-browse?Val=A).

Another system from the same country, the *New Zealand Digital Library* (http://www.nzdl.org/), has had considerable social and international impact. It is based on the Greenstone open-source software created by the Department of Computer Science of the University of Waikato, Hamilton. It works closely with UN organizations and Unesco to offer a variety of humanitarian sites, on development, food and nutrition, the environment, disasters, etc. (Witten et al., 2002) Of major interest in the context of this paper is the Community Development Library (http://www.nzdl.org /cgi-bin/ library?a=p&p=about&c=cdl), with 1,785 publications offering multidisciplinary insights and solutions in various areas of community development. Documents come from numerous cooperating organizations, including FAO, the United Nations University, the Peace Corps, etc. Users can search for specific words, or browse by activities, organizations, titles or subjects. Another relevant collection is the Indigenous Peoples Collection (http://

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www.nzdl.org /cgi-bin/library?a=p&p=about&c=ipc), containing over 500 English language documents from around the globe.

Greenstone open-source software (http://www.greenstone.org/) is available free of charge and is supported by frequent training courses and a full-length book (Witten & Bainbridge, 2002). It has therefore been used for regionally relevant projects on a global scale. *Books from the Past* (http://www.booksfromthepast.org/) is a well-presented bilingual site, dedicated to preserving out-of-print books in Welsh or about Wales. In Italy the historic city of Vimercate, a few miles north of Milan, maintains a high-quality historical site, *Mirabilia Vicomercati* (http://www.mirabiliavicomercati.org/index.html). The local public library uses Greenstone to maintain an archive of 6,500 photographs and 250 post-cards (http://www.mirabiliavicomercati.org/sezioni/006/index.html). The multiscript and multilingual capabilities of Greenstone are put to good use in the digital library of the government of Mari-El, on the Volga River, one of the republics of the Russian Federation (http://gov.mari.ru/gsdl). Most of the site is in Russian, but parts are in Mari, a Finno-Ugrian language written in Cyrillic characters. The site contains regional and federal documentation, folklore, press releases and legislation. The geographic range of these examples demonstrates the value of Greenstone for communities outside of industrialized regions, where it is difficult to purchase commercial digital library software.

So far this paper has only presented examples of visually oriented digital libraries, but electronic technology can also facilitates online access to audio and video materials. *FARNE: Folk Archive Resource North-East* (http://www.folknortheast.com/), offers a comprehensive overview of Northumbrian music, with 400 sound recordings, 13 videos, several thousand items of sheet music, photographs, etc. The site is supported by public and academic libraries in Gateshead, Newcastle upon Tyne and nearby cities. Regional communities in Britain often define themselves by local accents, which can be heard in *English Accents and Dialects* (http://www.collectbritain.co.uk/collections/dialects/). Over 130 audios, identified by location, age, sex and occupation of the speaker, offer a fascinating panorama of regional speech. Materials were taken from the Survey of English Dialects and were recorded by the BBC or the University of Leeds. The site is part of the British Library's *Collect Britain* project (http://www.collectbritain.co.uk/collections/), financed by the National Lottery (Nicholson & MacGregor, 2003). Audio can also have considerable political impact. *The Flint Sit-Down Strike Audio Gallery* (http://www.historicalvoices.org/flint/index.php) offers contemporary audio about an auto workers' strike in Michigan in the 1930's. A timeline combines audio with contemporary photographs. As the audio is played, a transcript appears. Online video of regional relevance is still rare, but can be found occasionally, for instance in the British Columbia Archives' *Amazing Time Machine* site (http://www.bcarchives.gov.bc.ca/exhibits/timemach/main.htm). This school-oriented site includes early film of the first inhabitants of the province (http://www.bcarchives.gov.bc.ca/exhibits/timemach/galler07/frames/wc_video.htm).

Despite technological advances, users rarely have the opportunity to interact directly with digital libraries. One regional collection which does permit active participation is the *Ohio Memory Online Scrapbook* (http://www.ohiomemory.org), which contains 26,000 images from 330 archives, museums, historical societies, and libraries throughout Ohio. The "My Scrapbook" feature allows users to store favorite items, add captions or notes, and then share with others. Archived scrapbooks on women's history, Ohio Presidents and Business and Labor are available at http://www.ohiomemory.org/featured.html.

CONCLUSION

It is difficult to quickly summarize the results of this overview of digital library services, because variety is an obvious feature of the systems cited. They are varied in nature, presentation, size and software. They can also occur in any part of the world, in any language. The unifying factor is that they all celebrate and disseminate the culture, achievements and individuality of specific regional communities. They all offer organized access to significant quantities of digital materials from local libraries, archives and universities. There are no geographic boundaries to the creation of digital libraries, and this paper has cited several examples of valuable systems created in regions where traditional library services are still inadequate. By offering materials which attract wide sectors of the population, digital libraries contribute to the eventual erosion of the digital divide.

The factors which contribute to the success of regional digital libraries are similar to those for digital libraries in general: valuable content, attractive presentation, efficient search and retrieval mechanisms and careful content description. It is also possible to indicate specific features relevant to regional digital libraries. It is useful to be able to initiate with a selection of high-quality images. Special approaches for teachers and school children are also valuable. Regional digital libraries create interfaces in local languages and respect the values of specific communities. Significant problems include lack of standardization of digital library content and presentation. Users cannot be certain of the content or structure of a specific digital library until they access it. There is no specific guide to regionally oriented digital libraries.

FUTURE TRENDS

Successful regional digital library services are based on dynamic traditional library and archive systems, which leverage their pre-existing content and established position in society to continue to disseminate local culture and achievements in a digital environment.

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KEY TERMS

Association of Research Libraries (ARL): An organization that unites the 123 leading research libraries in North America (http://www.arl.org/index.html).

***Collect Britain* project:** A major digitization project from the British Library (http://www.collectbritain.co.uk/).

Community Development Library: Part of the New Zealand Digital Library, offering free access to a range of documents on community development (http://www.nzdl.org/cgi-bin/library?a=p&p=about&c=cdl).

Digital Library: Provides the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Waters, 1998).

Digital Library Federation: A consortium of U.S. libraries, pioneers in digital library development (http://www.diglib.org/).

ELib: Electronic Libraries Programme: British digital library research and development programme, 1995-2000 (http://www.ukoln.ac.uk/services/elib/).

Greenstone: Widely used open-source software for digital libraries, developed in New Zealand (http://www.greenstone.org/).

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Radio for Social Development

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INTRODUCTION

"*Tell me a story*" is an established educational technique. "*Tell me a story*" using radio is an application of this technique, but instead of having one or several listeners, it is possible to reach thousands or millions of people throughout both urban and rural areas. *The Archers*, was a British radio drama serial that started its life with educational objectives and has been broadcasting for decades to a large dedicated audience of millions (Gallagher, 1975). This article will describe how a radio drama education project expanded into small local communities, each with its own community radio station, and how the actors in the radio drama addressed specific health issues of a particular area through the use of live performances.

BACKGROUND

As far back as the 1970s, McAnany (1976) found in his Mexico study that in radio projects over two-thirds of listeners preferred to listen to music and drama and that few tuned in to local educational programs or programs from the capital city.

Supporting radio drama for behavior change with other resources is a key part of any radio education project. In a presentation on behavior change, Brooke-White (1985) saw non-formal radio education for adults as being concerned with change. She said the role of the media educator is based on the principle of learning by choice, and that change came from within the individual listening to the programs. Her comments referred to writers, editors and producers who needed "skills in the communication of structured information geared to facilitate change" (p. 1).

Fossard (1996) has written extensively on the development of drama for radio, giving particular attention and emphasis on making the messages suitable and credible to the listening audience. With a particular focus on soap opera in bringing about social change, Nariman (1993) suggests that radio drama is very effective if it makes sense to the listener, and it addresses issues similar to those faced by the listening audience using characters who are believable and who deal with the issues in a recognizable way.

In Africa, radio drama is regarded as being very effective in the education of rural people if it "encompasses cultural factors such as the oral tradition and social learning through performance" (Morrison, 2003, pp.1-4). Other factors that make drama an effective medium include the recognition that rural people tend to have lower literacy rates than urban people, they cannot be reached by other means of communication such as newspapers or television and that generally, there is homogeneity and social cohesion in small villages. The spoken word and traditional forms of drama incorporating cultural values and beliefs are the primary ways of educating the young and to sustaining cultural mores among adults in such situations.

An example that showed the impact of broadcasting radio drama programs took place in Tanzania during the period 1993 to 1997 (Ryerson, 2003). After four years of broadcasting, a Radio Tanzania drama serial had succeeded in attracting 58% of the population between the ages of 15-45 in the broadcast regions. Evaluation research of the radio drama conducted by The University of New Mexico and the Government of Tanzania showed that this radio serial stimulated behavioral changes. More than half of the population in the areas where the serial was transmitted identified themselves as listeners. HIV/AIDs is a huge problem in Africa and this story had, as one of the key characters, a truck driver with numerous girlfriends dotted along his truck journey route. He became HIV positive. Of the listeners surveyed, 82% said the program had caused them to change their own behavior to prevent HIV infection by using condoms and limiting their number of sexual partners. Independent data from the AIDS Control Program of the Tanzania government noted over a 150% increase in condom distribution in the broadcast areas during the first year of the soap opera.

Other data collected through Ministry of Health clinics indicated that the radio soap opera had influenced family planning methods in four out of ten new adopters. This included a quarter of the respondents who could cite the soap opera by name. Another 16% cited "something

on the radio" and then identified the soap opera as their source when shown a list of programs being broadcast.

While radio serials obviously build up a regular listening audience and the potential for behavior change, it is also possible to use radio drama as a tool with campaign radio.

In Vanuatu, a small South Pacific nation, a radio drama project on health advice has strong links with the running of a local clinic. *Famili Blong Sarah (Sarah's Family)* is a weekly radio drama series aiming to increase knowledge of, and promote positive attitudes about, reproductive health issues. The soap opera also served as a teaching tool for nurses, teachers, and aid post workers. The first 20 episodes were dedicated to character development in the hope that the audience would bond with the radio characters before sensitive sexual health issues were introduced. Over 180 episodes have been produced to date. On their Web site, Wan Smol Bag notes "live performance and face-to-face training sessions are preferred, but radio drama can reach islanders nationwide on a consistent basis."

LEPROSY EDUCATION USING LIVE RADIO BROADCASTS

An example of health education using a live radio broadcast performance at Alto Molocue, a town in the poorer part of the Zambezia province, Mozambique, took place at the beginning of 2003. A Danish NGO had funded a new FM community radio station in the town to broadcast items of interest and of educational and social value to the people of the area. Alto Molocue has the misfortune of having a high incidence of Leprosy, and it was one of the few places where the Portuguese colonizers had built a treatment center. Although since Mozambique gained Independence, the center has had little maintenance. For 50 years, medical authorities have been doing their best to contain and cure the disease and have had some successes and some failures. Leprosy tends to be a "cunning" disease. Many young people who catch Leprosy do nothing about seeking medical help until the disease makes its first serious attack on their nervous system. A child will get a white mark on their skin. It does not itch or form an uncomfortable rash and often nothing is done. It is only when the disease has shown more serious manifestations that people will seek help and by that time it is too late to reverse the damage. Yet, leprosy can be cured if it is caught in its early stages.

In January 2003, a medical specialist in charge of Leprosy care in Alto Molocue obtained funds for the promotion of a small project "to celebrate fifty years of Leprosy care and treatment in this district." He began preparing printed resource materials, coached a small

theatre group to perform a play using traditional characters and showing how to detect the disease and to seek treatment, using methods and messages understood and familiar to the local people. He made contact with a radio drama coordinator who was producing a regular weekly radio drama series for rural people. Within a short time, the decision had been made to pool resources from the two projects. Thus, the small project began to expand into a larger multimedia educational event aimed at educating the people on early detection and treatment of leprosy, and making it possible to treat the disease before serious damage to the body occurred.

Using radio drama, entertainment, pre-recorded interviews, structured information and resource support from the radio education project, the local radio station manager suggested that the event take place over a whole weekend. Two experienced local radio announcers from Radio Mozambique (a six-hour drive away), who spoke the local Elomwe language had visited the area to collect a number of interviews from Leprosy patients and medical staff. One producer made a point of collecting information from the local community. He said that "It was important to hear first men and then women make the same point. This way villagers and local people believe it. Always in our culture, you need different people repeating ideas—both sexes and people with respect in their lives, that is, the leaders" (Monteiro, 2003). Radio public service spots were prepared and the radio drama producer trained the theatre group to perform for a live audience and a simultaneous live radio broadcast. The Leprosy doctor talked with a local priest and organized the first ever live radio outdoor church service. The service was dedicated to the medical care of Leprosy. Extra copies of the printed resource material were prepared and printed.

To ensure non-stop live broadcasting, the professional Radio Mozambique broadcasters worked long hours over the weekend with the local radio staff who were inexperienced volunteers. People crowded into different venues in town to see the theatre group act, and they visited the radio station in large numbers. Competitions were held. Many adults and children won prizes. Around fifteen hundred people attended the special live broadcast of the church service. In terms of numbers and the apparent show of interest, the weekend was deemed a success.

While there was no formal research into the program impact, there was evidence that a large number of people had physically attended all the different events. Besides the live broadcasting, there were repeats of the pre-recorded interviews. After the event, the Radio Station Manager was approached and asked by various local groups to prepare and broadcast more radio programs on Leprosy and general health matters. She gave commu-

nity groups airtime to develop their own radio programs on public health. Listeners and those people who attended the theatre performances and visited the radio station had been made more aware of the help they could seek at medical clinics. This type of linkage is important. It shows community initiative and involvement that is independently stimulated by the programs. It also highlighted the strength of good communication between all the organizations working to produce the weekend event.

Within a very short space of time, other community radio stations wanted to be involved in educational community radio, thus reinforcing the view that local communities respond to educational messages involving drama. Various radio education campaign days were held throughout Zambezia in different towns. In each campaign, the actors who took part in the weekly radio dramas gave a live radio performance of a play. Within hours of their arrival at the town, word spread quickly that the radio actors were present. This knowledge acted like a magnet and people came to the performances because they "knew" the actors and they listened to the radio dramas. Local celebrities showed an interest in sharing in the campaign activities. Priests wanted to give church services, school teachers wanted to be interviewed, and the local council leaders offered to open the day's activities with a formal speech and ceremony. The actors became instant heroes and heroines. One of the Radio Mozambique producers working with the campaigns said he had worked in media for several years, but he had never seen actors receive such popularity and accolades.

Why were the radio educational campaigns so successful and why did they attract such large local audiences? Part of the success can be attributed to the actors being known to their audiences through the regular broadcasts and to the characters having credibility with the listening audience. The characters face similar situations to those experienced by their listeners and they acted like people in real life with their own problems and their personal relationships. There was a measure of cultural acceptance by the audience, community involvement through the involvement of local people and the pooling of material resources to maximize the impact of the campaign.

DISCUSSION

Van Zyl (2004) stresses that "Producers, writers and researchers in the field of development communication must sit down with funding providers and commissioners of programmes and convince them to move away from a blind faith in a single medium, the curse of media determinacy, to consider the entire social, economic, cultural and psychological context of the use of a medium in education and development programmes" (p. 2). Jallov (2003)

has a similar point of view and notes that there are over 30 national languages in Mozambique that can be grouped into 14 different language groups. She says, "National solutions to Mozambique's information and communication problems must take these factors into account..." (p. 116). Who can disagree? It is the old but so frequently forgotten point that you cannot teach effectively in a vacuum. You need to have an understanding of the culture and the ways in which people learn. Effective communication in radio requires people with skills, knowledge, cultural sensitivity and an intention to incorporate as many diverse elements into their programs as possible. Radio is only one medium. But with support from print, posters, community resources and support people from the community, communication begins and subsequent behavior change takes place over a period of time. Time for real change takes not months, but years of broadcasting. There is a need to increase the number of listeners and to then hold their attention week after week. Part of the task is scheduling programs at times suitable for your listening audience. Program credibility is essential and cultural values need to be present in all the radio programs. Care is required with the language level, amount of content presented and presentation styles.

A study of 14 radio serials around the world by The Communication Initiative (2004, p.18) identified a number of replicable features including:

a.   Having an integral and ongoing audience research component;

b.   Incorporating audience feedback at every stage by reading letters on the air, adapting storylines in response to research, running competitions and so forth, will help to keep and increase audience;

c.   Paying constant attention to entertainment quality, realism and production values will keep audience, radio stations and donor funders happy;

d.   Giving strong attention to initial and in-service staff training is something that is sometimes overlooked, but pays off in the end;

e.   Collaborating closely with existing social/health/agriculture services is vital if the media intervention is advocating the use of specific services/technologies, and can be extremely damaging to the project, if overlooked;

f.   Paying strong attention to back-up materials in print and in person, and/or to accompanying factual/documentary/Q&A programs;

g.   Addressing both the supply and the demand side, that is, providing education and support for suppliers of health services as well as encouraging demand for health services from the general public;

h.   Promoting the show by running on-air spots/trailers and/or by advertisements in the local press seems to increase the audience; and

i.   Paying constant attention to the broadcast channel to be sure the show is on the air at or as near to prime time as possible.

A sustained time frame of broadcasting is a key ingredient of the media education package. In Mexico, Miguel Sabido developed five family planning soap operas: Vamos Juntos ("We Go Together"), Caminemos ("Let's Walk"), Nosotros las Mujeres ("We the Women"), Por Amor ("For Love"), and Los Hijos de Nadie ("Nobody's Children") that were broadcast from 1977 to 1986. During the time, these programs were transmitted there was a 34% decline in the population growth rate. In 1986, Mexico received the United Nations Population Prize for its role as the leader for the population success story in the world (Ryerson, 2003).

The University of Northumbria in Britain evaluated the impact of a two and half year radio education project in Zambezia (Collins, 2002). This was the project that was also involved in the radio campaigns. The project designed a weekly educational radio drama and radio magazine for rural listeners. It was broadcast in two different local languages and repeated at times when there were a maximum number of listeners to the radio, for example, early morning and in the evening. After the program had been transmitting for one year, the university research team found that around half the population (53%) had become regular listeners to the radio drama serials. In one district, 47% of the listening audience said they had implemented something they had heard about in the programs. The same evaluation team also reported on the radio magazine program, which was transmitted in a similar time slot, with repeat broadcasts and with similar content messages to the radio drama. It had approximately half the number of regular radio listeners compared to the radio drama serial. In their comments on the radio magazine, listeners did not mention any details of the content. Yet, in the same district over 80% of the radio listeners correctly identified the names of the radio drama characters.

Why should there be a difference between the two programs, the radio drama and the radio magazine? Both programs were in similar languages, covered similar content, broadcast at similar times and were designed for the same audience by the same project team. Much of the material in the weekly magazine programs consisted of interviews with experts and narration by the radio announcer. It must be assumed that it was the format of the programs, the language used and style of presentation that made the difference. A drama with an exciting story is more attractive than experts expounding on their field of expertise and sometimes talking in a voice that lacks the passion of a trained actor. Hence radio drama is a powerful tool.

In a final independent survey of the radio education project conducted in May 2003, it was noted that the message content needed refining. "The tone of some of the results from this survey also suggest that it may be time in some areas to increase the level of detail in the messages that go out through subject specific broadcasting" (Collins, 2003, p.7).

What can be implied from this observation is that the radio drama broadcasts have already built up a regular listening audience who find the programs credible and interesting and that they have absorbed some of the social messages. A report (Compton, Oliveira, & Spence, 2002, p. 20) on the same project came to the conclusion that "the 'radio soap' has just begun to gather a wide following, and its effectiveness will increase over time with increased listenership and increased experience of the local producers."

If the programs were continuously broadcast over several years, positive behavior change could be expected to take place. The same message echoes again and again through the research of radio drama for education. A radio serial creates awareness in listeners, transmits information effectively, but it needs ongoing human and material resource support and a long-term broadcasting commitment if the embedded social messages are to be absorbed and turned into positive behavior.

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KEY TERMS

Drama Serial: An ongoing story told in dramatic form incorporating sound effects, music, dialogue and/or narration. It may be broadcast once, twice, or several times in a week, and it is usually from 15 to 30 minutes in duration. Sometimes, it is referred to as a "soap opera".

Drama Series: A story also told in dramatic form with a fixed number of episodes.

Radio Campaign: A project focused on a district or town with a radio station. It seeks to involve the whole community through, for example, radio, singing, dancing, competitions, displays, use of local officials, experts, schools and organizations. Its duration is variable.

Social Messages: These are created to both entertain and educate so that a listener will increase their knowledge on educational issues, develop favorable attitudes to the messages and change their behavior.

ENDNOTE

[1] Wan Smol Bag is a theatre group dedicated to addressing social issues through drama education.

Regional Tourism and the Internet in Australia

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INTRODUCTION

With economic agents operating in global networks of interaction, we now have a global economy, in which the use of ICTs and e-commerce has an impact on entire industries, regions, and firms of all sizes (Lundvall & Archibugi, 2001).

Adoption of electronic-commerce (e-commerce)—referred to here in terms of connection, electronic data exchange, and transaction capability via the Internet—and networked technologies by firms is directly related to the size and nature of the firm and largely depends on the firm's perception of affordability and opportunity for their business (OECD, 1998). The greater the number of parties involved in e-business activities, the greater the potential to form relationships and transact and gain benefits (Rogers, 1997).

The growing influence of new communication technologies is relevant to regional development in that the diffusion of ICT and the Internet directly impacts interactions between regional and global forces. This article discusses the adoption of e-commerce technologies by regional tourism firms in general and by regional Australian small and medium size enterprises (SMEs) in particular. Australian tourism SMEs continue to be reluctant e-commerce adopters as they have a negative perception of the effectiveness of networked technologies. As a result, industry preparedness falls well short of the requirements to operate within a now mainly ICT-driven sector.

REGIONAL TOURISM FIRMS

The push toward networked technologies has put extraordinary pressure on the tourism industry to embrace the Internet for marketing and transaction purposes. As consumers become more knowledgeable about the Internet, they have increasing expectations in terms of viewing and purchasing tourism and travel products online (Wynne, Berthon, Pitt, Ewing, & Napoli, 2001). ICT-literate consumers now expect to find information, book, and purchase local and regional travel, tours, and accommodations via the Internet. To satisfy that demand, tourism firms of all sizes may need to expand their traditional marketing channels (for example, brochures, billboards, and stands at trade shows) and their conventional tour-ism product distribution channels (such as the use of travel agents, destination marketing organisations and travel wholesalers) to include the Internet for business-to-consumer (B2C) interaction (Buhalis & Main, 1998).

The Internet provides tourism industry players with far-reaching B2C opportunities to offer virtual tourism product and develop or enhance relationships with their customers. The potential for commercial travel sales is widely recognized and has given rise to new market entrants coming from an information technology rather than from a travel background. For example, the new generation of highly successful mega-Web sites, such as Expedia and Travelocity, offer end users access to booking systems that include air, hotel, car, and vacation packages. By facilitating Web-based sales and honing customer services through customer profiling, mega travel sites may seemingly provide all a traveler could ever want or need (Bernstein & Awe, 1999). However, these mega-travel sites on the Internet are run by large operators, realistically excluding small tourism product providers and restricting small tourism firms and customer's access to one another (Anckar & Walden, 2001).

In many parts of the world, small and medium-size tourism firms (tourism SMEs) make up the majority of the tourism industry. For example, most of the accommodation establishments worldwide are family-run tourism SMEs belonging to local entrepreneurs (Buhalis & Main, 1998). In many regions, tourism SMEs and micro tourism enterprises, therefore, make a substantial contribution to regional economies (Braithwaite, 2001). As a result, there is renewed interest in regional economies and online technologies to develop, market, and distribute regional tourism products. At the same time, regional policy makers are finding that incentives for ICT and online technology adoption are necessary to improve the effectiveness of the small tourism firm. Taking the view that e-commerce represents a dramatic change in the way people learn about destinations and book their vacations, the Scottish Tourist Board, for example, increased its 2000/2001 budget by 25% in order to accelerate Scottish tourism into the "e-age" (Morrison & King, 2002).

While connectivity has the potential to increase regionally based tourism SMEs' visibility in the marketplace, small tourism enterprises have been facing difficulties embracing ICT and e-commerce. The uptake of technology has not been a priority for many small tour-

ism firms. To begin with, micro and small tourism enterprises generally consider themselves outside the tourism value chain, despite the fact that most of their customers are tourists (Evans, Bohrer, & Richards, 2001). European studies on the uptake of technology by tourism SMEs further indicate that because of their size, small tourism firms often lack the time, skills, financial resources, and manpower needed to implement ICT and compete with their larger counterparts (Buhalis & Main, 1998). As small individual enterprises, they tend to be preoccupied with the operational running of their business. As a result, they fail to focus on marketing planning and online business transaction, and approach their market less formally and more intuitively from direct contact with their guests (Main, 2002). Because proprietors of tourism SMEs are often dependent on external ICT expertise, they fear losing control and are therefore resistant to change (Anckar & Walden, 2001). To make matters worse, tourism SMEs are often located in peripheral regions where the ICT infrastructure, especially broadband, can still be inadequate or prohibitively expensive due to limited demand.

REGIONAL TOURISM IN AUSTRALIA

Tourism is considered one of Australia's industry sectors that will likely benefit from e-commerce, as it can offer products and services that are receptive to e-commerce. Looking at regional and local impacts of e-commerce, country areas that depend on tourism and related activities can expect a large boost from e-commerce (NOIE, 2001). However, a national tourism online scoping study (CRC Tourism, 1999) indicates that before 2000, only 4% of Australian businesses with an Internet presence were tourism and travel businesses. Hence, it was seen as imperative for Australian tourism firms to invest in skills and alliances to exploit new technologies and to enter emerging markets to avoid potential loss of competitive advantage (Danielle, Mistilis, & Ward, 2000). However, to date, Australian tourism SMEs have shown few signs of interest in adopting networked technologies such as e-commerce, in some instances, displaying outright reticence toward the adoption of networked solutions (Applebee, Ritchie, Demoor, & Cressy, 2002).

Research indicates that Australian tourism SMEs lack the advantages of larger tourism enterprises, such as resources, know-how, and access to global distribution and other networked support systems. Much like tourism operators in other regions of the world, Australian tourism SMEs lack the size and scale to compete with their larger counterparts, which are in a better position to dominate the Australian tourism online market (Prosser et al., 2000). Studies on ICT uptake by small

Australian tourism firms also demonstrate that non-users continue to have strong negative perceptions about the effectiveness and adoption of the Internet. As a result, industry preparedness falls well short of the requirements to operate within a now mainly ICT-driven sector, and industry knowledge relating to the potential advantages of adopting e-commerce still needs to be considerably expanded (Applebee et al., 2002).

Although ICT uptake by Australian tourism SMEs has increased somewhat in the past two years, the main ICT application that has been adopted by regional tourism SMEs is electronic mail (e-mail). Encouraging as this may be, it is apparent that many small tourism firms have not yet been ready to migrate from fax-based to Web-based transaction processes. Indeed, study findings in regional Australia indicate that e-commerce adoption is an incremental process and that ICT adoption by tourism SMEs should be seen as a series of separate, yet interrelated, adoption steps, starting from electronic mail (e-mail), followed by product promotion and a Web site presence, and then adoption of e-commerce (Braun, 2004). This rate of incremental ICT adoption by regional Australian tourism SMEs is in line with ICT adoption trends in other countries. A recent survey of small tourism firms in Greece, for example, confirmed that tourism SMEs primarily see the Internet as a mechanism for promoting their business rather than for e-commerce purposes (Buhalis & Deimezi, 2003).

FUTURE TRENDS FOR REGIONAL TOURISM

Because tourism SMEs are relatively new to the virtual world and appear to have neither the expertise nor the resources for e-business, they are in danger of being isolated and out of touch with changing marketing and e-commerce dynamics (Hutt, LeBrun, & Mannhardt, 2001).

Although ICT still appears to intimidate small regional tourism firms, there is also reason to be optimistic. Regardless of their size or location, there are ample competent entrepreneurs who will take advantage of the opportunities that the Internet offers. An English study (Evans et al., 2001) found that independent micro firms were among the most creative users of ICT, and that the level of ICT usage among small tourism firms surveyed was higher than expected, given the perceived limitations of such firms vis-à-vis technology adoption. While the latter is indeed encouraging, a recent survey of tourism SMEs in the European hotel sector demonstrates that small tourism firms are not yet utilizing information technology for e-commerce purposes (Collins, Buhalis, & Peters, 2003). We have known for some time that e-commerce

novices need substantial encouragement and support to make them willing to take the e-business plunge (CRC Tourism, 1999), and Australian research indicates that regional tourism firms would benefit from continued support and training in relation to e-commerce (Braun, 2002).

Tourism SMEs will likely have varying levels of digital literacy and understanding of the potential strength of interactive communication tools. Awareness, confidence, and competence in e-business play a significant role vis-à-vis e-business platform adoption, but it will be some time before SMEs are ready to drop the "e" out of e-business and consider e-commerce part of their daily business routines (Earl, 2000). For many small tourism businesses, e-commerce is still a new product, and ICT is a language they do not yet understand. In considering training, it is important to have an understanding of the real and perceived barriers and challenges to online adoption, as seen through the eyes of individual small tourism business owner-operators (Morrison & King, 2002). Initial value for small tourism firms lies in debunking ICT jargon, cutting connectivity costs, gaining online visibility, and gaining trust in and perceiving value in new technology tools. Individual SME capacity building will not only create e-business awareness among individual operators but will also help to reduce isolation and maintain core market reach in a rapidly changing economy. By making e-markets more accessible, training can also generate support toward destination/regional partnership building (Braun, 2004).

In the context of emerging technologies and related regional development models, linking stakeholders in networks is believed to enhance competition and regional innovation (OECD, 2001). It has further been suggested that destinations that integrate ICT-based networking and cooperative marketing strategies to create tourism SME networks of scale could further reduce SME isolation, bring tourism SMEs and cyber customers together and increasing the willingness of cyber customers to purchase tourism products from smaller suppliers. By drawing on a broader skill base through the forging of new partnerships between small tourism firms and regional e-business experts, issues such as regional product development and global customer reach may be addressed.

Many regional tourism SMEs have already started to consider adopting networked infrastructures and strategic alliances in order to counteract possible loss of competitive advantage in the networked economy. In a survey study conducted among small tourism firms in England, respondents from both the macro (destination) level and the individual SME level indicated that they could see the potential benefits of using Web technologies for joint marketing and securing new business collaborative purposes (Main, 1999). Another British study similarly showed that the development of a shared destination Web site proved to be attractive to local tourism operators (Evans et al., 2001). Indeed, examples of destination network formation can now be found in tourism regions across the globe (Pavlovich, 2003; Ryhänen, 2003).

With networking on the rise, the opportunity exists to cultivate a new ethos of connectivity between tourism SMEs, but such a collaborative or network culture is not present as a matter of course in every region. A systemically embedded culture of competition and autonomy may prevent network building from taking place (Buhalis & Cooper, 1998). Researchers highlighted varying degrees of reluctance by SMEs within the tourism sector in terms of joining a network (Braun, 2004; Evans, 1999). Therefore, network formation may need to be fostered, especially in regions where tourism SMEs are not naturally prone to collaboration or may be geographically dispersed. Informal processes such as attending seminars, attending local or regional tourism association meetings, and participating in online chats with other firm managers can help establish interfirm relationship building (Braun, 2004). Incremental and more formal levels of virtual collaboration may be introduced once tourism SMEs are receptive to transform their local and regional relationships within online environments, such as Web portals.

In courting tourism SMEs to participate in new communication channels, such as a Web portal, the network will need to have appeal for SMEs. Merely providing a portal platform with e-business capability will mean little when stakeholders do not see the value proposition. In other words, successful network adoption for tourism SMEs requires both training and thorough strategic planning. Information partnership environments should have clearly defined benefits for participating tourism SMEs, e.g., savings in time and resources, enhanced market visibility, and strategic regional leverage. Thus, the structure of the destination network and the manner in which the linkages between tourism SMEs are formed and maintained are critical (Pavlovich, 2003).

CONCLUSION

Many tourism SMEs at the regional destination level have yet to explore in greater detail the value and opportunities of ICT and e-commerce, as well as the wider market options in terms of local–global relationships.

There is no doubt that tourism SME managers of the future will need to become familiar and comfortable with technology if they want to exploit its potential. In many instances, support and training for tourism SMEs can help small tourism businesses to enter the e-commerce marketplace. Network formation can further assist tourism SMEs to avoid isolation and share the costs of ICT investment.

Understanding the potential of the Internet will provide tourism firms of all sizes the opportunity to adopt new marketing and e-commerce models and become part of the global economy.

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KEY TERMS

B2B: Business-to-business trading involves the sale of goods or services by a business to another business.

B2C: Business-to-consumer trading involves the sale of goods or services by a business directly to individual customers.

Broadband: A type of data transmission in which a single medium (such as fiber optic wire) can carry several channels at once. Cable TV, for example, uses broadband transmission. Expand to include capability and how it differs from narrowband.

Connectivity: The ability to link to the Internet via a computer.

E-Commerce: Connection, electronic data exchange, and transaction capability via the Internet.

ICT: Information and communication technologies; the technology and tools used to transfer information and speed up communication processes.

Market Channel: A publicly accessible means such as a newspaper, magazine, trade show, radio, billboards, television, or the Internet, used to advertise, market, and distribute products.

Portal: A Web site or service that provides access to a wide range of services that can be either local or remote, structured or unstructured. The user stays inside the portal interface, which provides access to remote Web sites on the user's behalf.

SMEs: Small and medium-size enterprises; small and medium-size tourism enterprises are also referred to as SMTE. In Australia, a small-size enterprise refers to firms with less than 20 employees, and micro enterprises refers to those with zero–nine employees.

Supply Chain: A network of suppliers, storage facilities, distributors, transporters, and retailers that participate in the sale, delivery, and production of a particular product.

Value Chain: A value chain is a string of diverse companies working together to create or satisfy market demand for a particular product or a bundle of products.

Web-Enabled: Business systems that are supported by Internet technologies.

Remote Indigenous Australian Communities and ICT

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INTRODUCTION

Australia has approximately 1,291 indigenous communities, of which 1,210 are geographically isolated or located in rural areas some distance from centres of population (ABS, 1999). These remote communities are characterized by low socio-economic status and are highly disadvantaged in terms of basic health, education and other services.

Access to Information and Communication Technology (ICT) is also limited, most obviously because telecommunications infrastructure is concentrated in the population centres in the south-east of the continent, where the major customer base is located (DCITA, 2000). The degree of disadvantage varies considerably in different communities: some larger communities have either a computer-equipped administration office or a community access centre with several computers, Internet access and a trainer or manager; while others are small camps and outstations of sometimes less than twenty inhabitants without even a single telephone (DCITA, 2002b).

ICT offers new opportunities for the development of these remote communities and new opportunities for better communication and better service delivery. However, a number of issues need to be addressed before these benefits can be realized because the very remoteness of the communities, their small populations and environmental challenges mean that implementation of technology is difficult and costly (DCITA, 2002a). To a large extent these issues coincide with access problems that other Australians living in rural and remote Australia experience, but there are also a variety of social, educational and cultural factors which are specific to Indigenous communities. Generally, ICT improvement in such communities is a digital divide issue (OECD, 2001).

BENEFITS FOR REMOTE COMMUNITIES FROM ICT

There are many potential benefits that remote Indigenous communities can gain from ICT. Essentially, ICT reduces the disadvantage of location (Daly, 2001). With high levels of poverty in these communities, the World Wide Web can increase employment and business profitability by providing direct access to global markets for indigenous products and services without the need to go through a middleman (Dyson, 2004). Further indigenous job opportunities derive from the need to develop culturally appropriate Websites to sell these products. Locally-based jobs in ICT implementation and in ongoing computer maintenance, management and training are also necessary and unlikely to be adequately provided by outside personnel, given the geographic isolation (DCITA, 2002a). An important benefit is the better delivery of a wide range of government services by means of the Internet and videoconferencing (DCITA, 2002a). ICT offers new ways of re-establishing social networks and enhancing cultural maintenance given the

Table 1. Potential benefits from ICT

Increased Employment:	
E-commerce	Internet sales of arts and crafts
	Websites to promote cultural tourism
ICT jobs	Web design
	ICT installation and maintenance
	Computer training
	Management of Community Access Centres
Improved Service Delivery:	
Education	Distance learning
	Web-based training of teachers
Health	Telemedicine clinics using videoconferencing
	Online Medicare claims
Justice	Videoconferencing of court hearings
	Family video link-ups with prisoners
Welfare	Online benefit claims
	Online information about welfare entitlements
Government	Participation through e-democracy
Banking	Online account enquiries, transfers and loan applications
Postal services	Online delivery enquiries and money orders
Enhanced Communication:	
Indigenous	2-way radio networks within communities
	Videoconferencing between communities
Mainstream	Website promotion of Indigenous culture
	Mainstream media access
Cultural Maintenance:	
Local	Sacred-site management systems
	Cultural databases and CD-ROMs
Distance	Videoconferencing of cultural events
	Indigenous TV and radio programming

historic disruption of indigenous lines of communication and fragmentation of many communities and cultures (Nathan, 2000). Communication with the broader Australian and world community via the Web is also needed to correct false representations and stereotypes of indigenous people and their culture (McConaghy, 2000). Table 1 summarizes some of these benefits.

CRITICAL ISSUES IN ICT ACCESS

Factors which limit remote communities' access to ICT can be divided into supply and demand (Daly, 2001). On the supply side are issues of technology, the infrastructure which is needed to support it, as well as environmental and geographical factors which impact on its operation and accessibility. On the demand side are a range of human issues which can be classified as social, educational, cultural or business. Many governments see the roll-out of technological infrastructure as the fundamental issue in bringing ICT to remote regions (OECD, 2001). Indeed, indigenous communities suffer many of the same technological problems as other remote Australians, for example, delays in telephone installation and repair, slow data speeds and cost (DCITA, 2000). However, for indigenous Australians these problems are exacerbated by entrenched poverty and poor living conditions. Indeed all of these factors interact in complex ways to create major barriers to ICT access.

Supply Factors in ICT Access

Issues of supply which impact on ICT access are summarized in Table 2 with some examples of solutions.

Table 2. Supply factors in ICT access

Critical Issues	Examples of Solutions
Technological Factors:	
Affordability	Communal ownership through Community Access Centres and Internet kiosks
Availability	Satellite telephony Satellite Internet access Bandwidth-sharing technologies, e.g., CDMA Web content designed for narrowband delivery
Geographic Isolation:	
Distance from ICT infrastructure	Satellite technology
Environmental Constraints:	
Heat and dust	The Pitjantjatjara Council's (2003) Niri niri workstation, which withstands dust, sand, mice and black-outs
Isolation by poor roads and weather	Locally-based technical support
Lack of Supporting Infrastructure:	
No power	Solar power for radio networks and Internet kiosks
Intermittent power	Battery back-up

Technology Affordability

Cost is a major inhibitor of indigenous Australians accessing ICT, whether living in urban or rural areas. Only 10% subscribe to a standard home telephone service compared to 50% of non-indigenous Australians (DCITA, 2002a). Ownership of computers is low: for example, the Outback Digital Network found only 1,000 computers across a remote-area population of 45,000; and only 10% of people with computers had Internet access (DCITA, 2002a).

The cost of laying a telephone line in regions of low population density in Australia is six to ten times the cost per line in more settled areas (Cribbett, 2000). In addition to the standard price of a new telephone connection must be added the network extension fee for providing cable to the property entry point from the carrier Telstra's point of presence, plus trenching costs to the dwelling. For the Balkanu community these additional costs were estimated at $2,300 on average per residence (DCITA, 2002a). Moreover, providing telephone maintenance is costly, leading to poor repair times. Satellite phones and 2-way satellite broadband service are too expensive for most Indigenous communities. To these costs, which affect all Australians living in remote regions, can be added the extra expense of developing indigenous content and training associated with users who have had little exposure to computers (DCITA, 2002a).

Technology Availability

Many remote communities have no telephone service. In addition, remote Australia is poorly covered with respect to mobile telephony. Mobile phone coverage via terrestrial base stations is only 18% of the Australian landmass, largely concentrated around cities, towns and highways. Commercial considerations probably preclude further expansion (DCITA, 2002b). Of the 1,291 remote communities, only 200 now receive mobile signals. By contrast, mobile satellite technology covers 100% of Australia and provides an alternative to terrestrial base stations: however, affordability then becomes the determinant factor.

Internet access is also an issue when communities have no telephone service. Access to broadband technology, in particular, is limited since many indigenous communities are located far from Australia's fibre-optic and microwave backbone networks. Broadband is usually only available via Telstra's 2-way satellite service, which, like other satellite ICT, is expensive.

Geographic Isolation

The remoteness of these communities means that they are geographically isolated from ICT infrastructure. This, combined with sparse population and the high cost of ICT delivery, contributes to the poor availability of technology (OECD, 2001).

Environmental Constraints

Most remote indigenous communities are located in harsh environments with extremes of heat and dust, exacerbated by lack of air-conditioned premises. In addition, communities in northern Australia can be isolated from on-ground technical support and maintenance for up to three months by roads flooding during cyclone season (DCITA, 2002a).

Lack of Supporting Infrastructure

Computers and public telephones need an uninterrupted power supply. Many remote communities are not on the electricity grid and have an intermittent power supply. Of the 1,291 remote communities, only 281 are connected to the electricity grid, 133 have no electricity supply whatsoever, and 40% have regular interruptions (DCITA, 2002a).

Table 3. Demand-side issues in ICT access

Critical Issues	Examples of Solutions
Social Issues:	
Poverty and debt management	Pre-paid cards for public and private phones Coin-operated Internet kiosks
Small population base	Sharing costs through communal ownership
Vandalism and theft	Substituting coin operation with pre-paid cards Painting phones and centres with traditional designs to create sense of ownership
Educational Issues:	
Low computer literacy	Computer training Development of culturally appropriate courses and learning materials
Lack of Indigenous ICT professionals	Indigenous university and TAFE ICT programs
Cultural Issues:	
Non-English background	Indigenous language-based content Indigenous helpdesk staff
Oral, non-written	Phones Videoconferencing Communal radio networks Multimedia and graphics (Web, CD-ROM) Visual menu items
Communal-based	Community Access Centres Public telephones Videoconferencing Communal radio networks
Business Issues:	
Poor business understanding	Mentoring programs Business training
High default rates	Business risk assessment Long-term monitoring

Demand Factors in ICT Access

Issues of demand which impact on ICT access are summarized in Table 3 with some examples of solutions.

Social Issues

A major demand-side factor which limits access to ICT is poverty and unemployment. Individual members of a remote community are unlikely to be able to bear the cost of technology by themselves. Individual debt management is a major issue when community and family obligations result in high usage levels of private phones for which the subscriber is unable to pay. For this reason there is a high rate of disconnections (DCITA, 2002a). In addition to individual restrictions, communities as a whole have difficulty funding telephone lines, computer facilities and Internet connections because of their small size and hence small customer base. For example, only 149 communities have a population greater than 200 people, whereas there are 644 communities with populations of less than 20 (ABS, 1999).

Poverty also impacts on the security of phones and technology facilities. Coin deposits in public phones and expensive computer equipment in community centres can be a temptation to impoverished young people. Vandalism and theft are common (DCITA, 2002a).

Educational Issues

Of the 1,291 remote communities, 48% do not have a secondary school within 100 km, and 149 do not have a school of any kind within 100 km (DCITA, 2002a). Schooling levels are therefore low, which, coupled with low computer ownership at home and lack of technologically-competent social networks, leads to low computer literacy (Barlow & de Lacey, 1998). Furthermore, there are few indigenous Australians trained as ICT professionals, which means that community needs for resident technical support and trainers go unmet (Robertson, Dyson, Norman, & Buckley, 2002).

Cultural Issues

Literacy levels are generally low in the indigenous population (Gray, 2001), and compounded by the fact that English is the second or third language for many indigenous Australians. This creates issues with reading English-language Webpages and documentation, with understanding training courses given in English,

and with awareness of available ICT services. Language issues have a particular impact on telephone support: communication difficulties mean that calls may not be made so that problems go unattended for long periods of time (Brady & Selva, 2002).

Indigenous culture is communally based with a strong emphasis on sharing, mutual support and group activities and spaces (DCITA, 2002a). This has implications for how ICT should be implemented and for the appropriate delivery of computer training. ICT which is individually focused may not be appropriate.

Business Issues

Business opportunities from ICT must be weighed against potential limitations. The main challenges are a generally poor understanding of modern commerce and historically high business default rates (Altman, 2001).

GOVERNMENT STRATEGIES FOR IMPROVING ACCESS

Over recent years government at all levels has been proactive in seeking to improve ICT access in remote Australia (Gibson Quai, 2001). Initiatives have concentrated in three main areas.

Supplying Infrastructure

The federal government sees the supply of affordable technology and infrastructure as the "key issue" in overcoming ICT disadvantage in remote regions (DCITA, 2002a). This has been the focus of their efforts to improve access and as such their development approach is based on a "technological push" or top-down model (OECD, 2001). Because of the high cost of supply and limitations posed by demand factors, roll-out of infrastructure to these communities has not attracted the interest of commercial providers. Moreover, since deregulation, cross-subsidy of remote users by city subscribers is less feasible than when a telecommunications monopoly existed. The federal government has therefore had to exercise its powers as telecommunications regulator to ensure a minimum standard of service from the main carrier Telstra, as well as targeting funding to remote-area programs which promote the take-up of phone, Internet and broadband technologies (DCITA, 2002a).

Even so, the safeguards have been criticized as not responsive to Indigenous needs and there has been low take-up of the government-subsidized 2-way satellite offer (PYMedia, 2004). The issue of how ICT infra-

structure will be funded in these remote communities is still poorly understood. Government expectations that community access centres, once in place, will become self-sufficient are unrealistic, considering entrenched social disadvantage and historical rates of Indigenous business failure. Moreover, no centres have proved economically sustainable without ongoing public funding, even in the mainstream community (CTN, 2002). One hope is that the continuing trend of ICT to decline in cost will improve the affordability in remote regions. Despite this, continued subsidy of ICT infrastructure will be necessary, supported by safeguards under the government's regulatory powers.

Establishing Basic Computer Training

After infrastructure, raising computer literacy levels has been the second main thrust of government policy. Basic computer training has been incorporated into community access centres, with funding supplied under "Networking the Nation" (2003). However, development of culturally appropriate training materials has received little attention, nor has funding been allocated by the government for the education of indigenous ICT professionals.

Researching Indigenous ICT Needs

In response to the Telecommunications Service Inquiry, conducted in 2000, which found that there was very little precise factual knowledge about indigenous ICT needs (DCITA), the federal government commissioned the *Telecommunications Action Plan for Remote Indigenous Communities* (TAPRIC) (DCITA, 2002a). This document comprises the first detailed study into indigenous telecommunications requirements as well as strategies for improving ICT access in remote communities. Despite highlighting many social, educational and cultural issues, the overwhelming emphasis of the report's 15 strategies is on improving infrastructure. Only $1 million is set aside for development of indigenous content and there is no acknowledgement of the difficulties in establishing successful indigenous e-businesses.

CONCLUSION

In a modern knowledge-based economy, ICT infrastructure may well be the "essential fourth service", after water, housing and power (ATSIC, 2003, p. 17). Indigenous Australians are becoming increasingly aware of the potential of ICT to overcome the disadvantage of geographic isolation and to offer their communities

"new solutions to old problems" (ATSIC, 2003, p. 16). As awareness grows, so does the demand for equal access to the new technologies in order to provide employment and business development as well as social and cultural renewal.

However, infrastructure alone will not bring the promised benefits. There are many issues limiting remote indigenous communities' access to ICT. Supply-side factors, such as technology affordability and availability, and geographical and environmental constraints, interact with demand limitations, such as poverty, poor schooling, lack of business understanding and a variety of cultural requirements. Many of these problems are complex and entrenched and difficult to resolve. Despite the acknowledgement of these points in the TAPRIC report, the main thrust of government initiatives has been a top-down approach aimed at improving ICT infrastructure. Even Telstra believes that infrastructure is not the most important ingredient in the digital divide (DCITA, 2002a).

As the relative cost of ICT declines and new capabilities emerge with the convergence of telecommunications, computing and broadcasting, the role of technological affordability and availability as limiting factors will decrease compared to the demand-side factors. The latter will persist if not dealt with effectively. As Daly (2001, p. vi) states, "Recognition of the cultural and social environments of rural and remote indigenous communities will be necessary to make these technological developments work for the people living there". In providing ICT access to remote communities a priority must be placed on the development of culturally appropriate content and the invention of new, robust and sustainable technologies which will operate in the harsh conditions of outback and tropical Australia. A critical issue, to date largely unmet, will be the training of indigenous ICT professionals to work in remote communities in support, maintenance and training jobs as well as in the design of new technologies which truly meet the needs of their communities. Above all, ICT implementation must come from the bottom up, driven by and in full consultation with the indigenous Australians whom it will be serving.

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KEY TERMS

Code Division Multiple Access (CDMA): A technology which allows mobile phone and satellite signals from different users to share the available bandwidth by uniquely encoding each signal.

Community Access Centre: A publicly-funded computer centre (also called Telecentre or Community Technology Centre) providing community members with access to computer training and computer technology, including computers, printers, scanners and the Internet.

Culturally Appropriate Content: Information, documents and programs delivered to users via the Internet, broadcasting or CD-ROM which express and respect the users' culture and interests.

One-Way Satellite Service: An Internet service that provides data transfer to the customer via satellite, but return path transmission from the customer via the standard telephone network.

Remote Indigenous Community: A community inhabited largely by indigenous people, located some distance from the nearest population centre and isolated from telecommunications and other services.

TAPRIC: Telecommunications Action Plan for Remote Indigenous Communities, released in May 2002 by the Australian Federal Government, which provides a framework for improving ICT to remote indigenous communities.

Two-Way Satellite Service: An always-on Internet service providing broadband data transfer to and from the customer via satellite.

Uninterruptible Power Supply: A backup electricity supply, in the form of batteries or other device, designed to provide continuous power to computer or telecommunications equipment in the event of a power failure.

The Role of Multinationals in Recent IT Developments in China

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INTRODUCTION

Many multinational firms have located in developing countries to develop their overseas and industrial markets and to take advantage of the low cost environments that exist there. In addition to locating internationally, companies like Philips, Microsoft, Siemens and others also are outsourcing globally and have chosen China as an attractive base for the Asian market and as a growing market in its own right.

Outsourcing implies obtaining goods or services by contract from an external source.

U.S. firms find it profitable to contract IT software and services in developing countries such as China. A recent study by McKinsey estimated that every dollar spent in outsourcing offshore represents a cost saving of 58c to U.S. businesses (Datt, 2004).

China's reform and opening up in the late 1970's gave the impetus to rapid economic growth. This reflects such outsourcing as well as its source of cheap labour, high-skilled workers, modern factories. Increasingly domestic demand and the size of the Chinese market provide a growth mechanism for the economy. However, limited resources and employment opportunities may impede sustainability of economic development.

CHINA: AN OVERVIEW

In 2003, China's GDP was around 11.7 trillion yuan (US$1.325 trillion) and, with a population of over 1.3 billion, its GDP per capita for the first time exceeded US$1,000 (Han, 2004). The economy therefore ranks sixth behind the US $10.2 trillion. The Chinese economy grew at an average of 10% pa during the 1990's–faster than the 3.4% average annual growth in the U.S. for the same period.

IT has been a significant industry underlying this growth. IT spending in China is expected to total $30 billion in 2004, which accounts for 3.3% of the world market. The Chinese expenditure in IT is expected to grow by around 20% in 2004-four times the rate of growth for the rest of the world (Nee, 2004).

Other statistics that demonstrate the rate of growth in China, especially IT, are as follows:

* China's electronic and IT industry ranked third in the world in 2003 with sales reaching approximately US$230 billion (an increase of 34% in 2002). Profits from this revenue approximated US$13 billion.
* There were 17,500 Chinese electronic enterprises employing 4.08 million people in 2003.
* Some Chinese enterprises were placed at the top in relation to worldwide semiconductor manufacturing and investment. For example, China Semiconductor Manufacturing International Corporation was ranked seventh out of the top 10, ahead of IBM.
* There are 8,582 software manufacturers in China with 18,000 product offerings. (Emerging Market Economy Reporters, 2004).

Total imports and exports reached US$800 billion accounting for two-thirds of GDP (Han, 2004, p.6) in 2003. Despite this, it could be argued greater emphasis in exporting value-added products is required. Certainly this in part is behind the government's support of the IT sector. China's Ministry of Information recently announced its vision to make the country a great power in IT. This vision is embodied in "the 11th five-year plan, commencing in October 2003" (World IT Report, 2004).

China is emerging as one of the major manufacturers of digital products-it is the leading manufacturer of laptops (making around half of the world's supply) and mobile phones (making around 35% of the present world supply). Yet many of these manufacturing firms are not Chinese firms but rather Taiwanese or multinationals who have located offshore.

China is poised to be the world's number two manufacturer of semiconductors in the next few years.

EXAMPLES OF RECENT IT ACTIVITY IN CHINA

Atos Origin, Europe's biggest IT consulting company and number five in the world, aims to quadruple its business in China over the next two years, thereby doubling its Asia Pacific business.

To achieve this, Atos Origin acquired Schlumberger Sema which in China serviced four state owned banks as well as provided IT services to six China bank credit card businesses (Liu, 2004). This acquisition will enable Atos Origin to infiltrate China's finance and high-tech manufacturing sectors. In addition as the IT partner to the International Olympic Committee, Atos Origin will take an active role in the 2008 Olympics.

Recently, Microsoft signed an agreement with Powerise Information Technology Co. Ltd., its second global strategic partner in China, in its quest to develop its overseas and industrial markets (Liu, 2004). This agreement facilitates training and co-operation, software development, sales and marketing and international projects.

Microsoft, through its agreement with Powerise, will seek to access telecom, finance, social security and government sectors. Through its initial partner, Beijing's China National Computer Software and Technology Service Corp. (CS&S), it seeks to access e-government and industrial application markets (Liu, 2004).

Microsoft is looking to align shortly with a third global strategic partner, Neusoft Group Ltd., one of China's leading software solution providers, based in Shenyang, a large industrialised city in north-eastern China.

Intel Corporation in April 2004 signed a Memorandum of Understanding (MOU) with Neusoft Group Ltd. with a view to establishing a Beijing Solution Innovation Centre and a Product Research Laboratory in Shenyang. The purpose of the latter will be to develop key technologies for the next-generation Internet and support the modernisation of the rapid industrialisation taking place in that city (M2Presswire, 2004).

General Electric (GE) to date has invested US$1.5 billion into the China market expanding into aircraft generators, power generators, finance, medical equipment, plastics and television (Xie, 2004) alone and in concert with Chinese enterprises. China is GE's fastest growing market with revenues growing in excess of 20% over the past decade (Xie, 2004). Sourcing from China is also expected to increase dramatically to around US$5 billion in 2005 (Xie, 2004). GE hopes to maintain this growth after the 2008 Olympics as it is a major sponsor.

FUTURE DEVELOPMENT

IT in China needs to be better integrated into the nation's industrialization. While IT adoption has greatly improved productivity and lowered costs of production (Han, 2004), improved infrastructure is required.

A number of developments and investments are being made as the country seeks to support industry, especially the IT industry:

- Industrialization of core information technology, for example, large-scale integrated circuits and new generation mobile ICT;
- Equipping traditional industries with IT;
- Adoption of science and management education to better utilise knowledge and skills; and
- Development of a supply chain to facilitate movement of goods to market.

Notwithstanding these, acceleration of these initiatives are seen by many to be required. In addition the role of the market in facilitating such development is recognised and is evident in many of the examples of IT activity outlined earlier.

A recent U.S.-China Business Council survey found that U.S. companies considered supply chain issues to be problematic for their business. Some of the reasons for this are as follows (Bin, 2002):

- Foreign firms required to import products through officially sanctioned trading companies. Third party foreign trading companies are not able to enter the market or provide a complete range of distribution services;
- Difficulty in finding qualified suppliers;
- Underdeveloped IT and ICT infrastructure;
- Unreliable transportation infrastructure; and
- Damage/loss in transit.

It would appear that IT improvements especially in terms of infrastructure would help to overcome a number of these issues. To this end, initiatives are occurring in industrial cities such as Shenyang-outlined later in this article. In Beijing, a consortium of Chinese corporations has been set up and is laying an urban communication pipeline network (SinoCast China Business Daily News, 2004) to facilitate ICT use in that city.

While many firms are outsourcing or locating in China to take advantage of the low costs of production and to enable easier access to the large market especially in IT, supply chains need to be set up and managed (Bin, 2002). However, logistics is only recently emerging, with supply chains in China being relatively immature.

SHENYANG: A COMMUNITY DEVELOPING AROUND ICT

The Shenyang Economic and Technological Development Area was established in 1988 as a region dedicated to industrial development. Foreign investors from 40 nations have invested there including 83 multinationals, 21 from the Fortune 500 Enterprises. 1,347 projects have been approved by the State Department of the People's Republic of China since its inception.

Shenyang, a city of over seven million people, is considered to be the "capital of Manufacture in China" (Administration Committee of Shenyang, 2004, p. 2). It comprises 1,586 enterprises (around 75% of medium-to-large enterprise in the city) and contributes 66% of the value of industrial output and 66% to tax income from manufacturing in Shenyang.

Development in the development area focuses around five industries:

* Equipment manufacture;
* Automobile and electric train manufacture;
* Medicine and chemical manufacture;
* Food and beverage manufacture and associated packaging; and
* Textile printing and dyeing.

Alongside infrastructure such as water, electricity, road, rail, gas and telecommunications services, fibre optic cables underpin the area providing broad-band network services throughout the region. The infrastructure provided in this development area however is considered to be "basic" (Administration Committee of Shenyang, 2004, p. 12).

In a visit to Shenyang recently, Intel Corporation's CEO Craig Barrett has encouraged northeastern China, within which Shenyang is situated, to use IT to bring about a transformation and to advance the region's competitiveness in an expanding global digital economy (M2Presswire, 2004).

Barrett argued that deploying and maintaining a modern IT infrastructure in the region will lead to improved efficiency and productivity, better access to markets, especially expanding global markets, and the promotion of long term growth (M2Presswire 2004). In his view, IT will create new capabilities for the region, including wireless network connectivity, collaboration capabilities, business analytics and security (M2Presswire, 2004).

Barrett asserted that for the northeast to become more prosperous, higher levels of investment were needed in computing and ICT infrastructure, research and development and education to take advantage of the industrialisation that was already taking place in cities such as Shenyang (M2Presswire, 2004). Government policies will need to be shaped to facilitate this. In this environment (of rapid technology) northeast China must have the infrastructure in place to sell products, communicate with customers and employees and deliver information electronically around the clock and around the world. This is the key to growth in northeast China (M2Presswire, 2004). As stated earlier, Intel has signed a MOU with Nuesoft Group Ltd. to assist in the modernisation of industrial development in Shenyang.

CONCLUSION

While much investment has been channeled into the development area in Shenyang to attract foreign investment, outside of the region infrastructure such as ICT is disparate. This will have an impact particularly on collaboration capabilities, efficient access to global markets and logistics.

China's entry into the World Trade Organisation no doubt will have an impact on accessibility of investors into the market and are expected to place pressure on infrastructure and logistics providers. Investment in IT such as that expressed by Intel Corporations CEO Craig Barrett is required.

Local logistics providers have responded to this challenge–such as COSCO–the largest Chinese ocean carrier, and Sinotrans–the largest inland carrier–which are developing intermodal and integrated services as well as investing in port and infrastructure facilities including electronic tracking (Bin, 2002). An urban communication pipeline network is being established in Beijing to facilitate ICT use in that city.

Recently, the Ministry of Communications announced a restructuring of ports was underway to improve logistics facilities. This upgrade is to include improved information technology so as to increase efficiencies (Bangsberg, 2003). In addition, the Ministry of Commerce has introduced reforms in the nation's national logistics system–"the government will intensify efforts to cultivate large logistics enterprises with nationwide networks and strong international competitiveness" (Bangsberg 2003, p.1).

The country is looking to grow "from a manufacturing powerhouse into the world's procurement centre" (Bangsberg 2003, p.1) with multinational's procurement in China likely to reach US $50 billion by 2005 from a figure of US $30 billion in 2002 (Bangsberg 2003). This will be facilitated by greater investment in IT and improved computing and ICT infrastructure; examples of which have been cited in this article.

Connections and relationships between organisations, including multinationals, and relevant authorities are important to future growth and success of the ICT industry in China, especially in regional communities. Personal relationships established with government officials in the past have often overcome or expedited problems that have arisen and are essential for organisations to enter into the marketplace.

The Chinese Government has a vision for China as a world power in IT and steps are underway to bring this vision to a reality, as evidenced in the future developments outlined in this article and the support for development in regional communities, such as Shenyang.

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KEY TERMS

ICT Infrastructure: The underlying facilities, services and installations needed for information communication technology (ICT) to operate.

Multinational Corporation: A company that owns or controls production or service facilities in more than one country and, therefore, conducts business globally.

Next-Generation Internet: The use of third generation technologies such as advanced multimedia wireless communication via the Internet.

Supply Chain: When organisations supply or purchase product or raw material from other organisations in business-to-business relationships, the relationship between these firms is said to be a "supply chain".

A Rural Multi–Purpose Community Centre in South Africa

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INTRODUCTION

There is an increasing focus on the growing disparity between the involvement of developed and developing societies in the new "information age." ICT are often seen as being the critical link to bridge this gap (Chapman, 2002). An ICT initiative that has been receiving increasing attention is that of the telecentre, and the related concept of the Multi-Purpose Community Centre (MPCC). The South African government is strongly promoting the diffusion of these MPCCs throughout the country, particularly in rural areas. An MPCC is specific type of telecentre, or "physical space that provides public access to ICTs for educational, personal, social, and economic development" (Gomez et al., 1999). The authors define an MPCC as a "telecentre which has a political motivation to aid in the upliftment of a disadvantaged group." However, successful MPCC initiatives are still few and far between. As Benjamin (2001) notes, "while there is much talk in international conferences of them, there are not many successful [telecentres] in developing countries." The reasons for the failure of many of these initiatives are still not clear, despite a number of research efforts (Avgerou, 1998; Montealegre, 1999; Moyo, 1996).

A growing strand of literature in the ICT for Development field refers to the interaction between technology and society (Brohman, 1996). This approach is often referred to as the socio-technical paradigm of technology. This study embraces this school of thought and hermeneutics is used as a theoretical foundation with which to explore the implementation issues.

BACKGROUND: THE MPCC IN DWARS RIVER VALLEY

The Dwars River Valley (DRV) of the Western Cape of South Africa is situated in a picturesque mountainous area traditionally known for its wine farms. There are a few large commercial wine farms in the valley, but the majority of the population lives close to the poverty line with high levels of unemployment present.

The Dwars River Valley MPCC (DRV MPCC), was implemented in 2002 and 2003, after a lengthy implementation process. The process started in 1998, when the *dominant* community within the DRV, Pniel, applied for government funds to start a Youth Centre. When the funds were approved in 2001, the amalgamation of the valley had already taken place, and the concept of the youth centre had evolved into the concept of an MPCC. Thus, what was originally planned to be the Pniel Youth Centre eventually became the DRV MPCC. The DRV MPCC was implemented with the goal of providing upliftment to the six communities of Kylemore, Johannesdal, Pniel, Lanquedoc, Banghoek, and Groot Drakenstein.

A project manager, with extensive experience in MPCCs, was brought in to manage the implementation process. The implementation was funded by two governmental funds: the Local Economic Development (LED) fund and the Human Settlement and Redevelopment (HSRP) fund.

The MPCC consisted of 10 computers, a printer, and a single dial-up Internet connection. Software on the computers included Windows, the Microsoft Office suite, and Microsoft Project. The centre was housed within an existing municipal building in Pniel, also the most central community in the valley, with plans to build a new, separate building during 2004.

The explicit aim of the MPCC when it was implemented was to foster economic development within the valley by creating spin-off projects that could use the MPCC infrastructure but would be separate entrepreneurial ventures. These ventures would contribute to the sustainability of the MPCC by paying for the services they required such as business support, desktop publishing (DTP) and so forth. The MPCC would also serve as a centre for individuals who needed training, telephony and other services.

The MPCC business plan was built around the centre eventually becoming a self-sustainable entity with the help of initial, start-up funding from government. It was

estimated that the centre itself could provide enough of an income to support three full-time employees.

In 2002, a committee of 12 community representatives was elected to make decisions regarding the MPCC and its implementation process. The committee was ultimately responsible for the project and consisted of two representatives from each of the six communities.

After an extensive consultation process supervised by the project manager, the committee decided on four focus areas for the valley: tourism, water, housing and agriculture. The tourism project was the most successful resulting in a number of spin-off projects, including a successful business removing alien trees from the river bank.

RESEARCH APPROACH

This article explores the implementation issues of an MPCC in a rural development situation by means of an analysis of the emergent themes of the study. The Hermeneutic Spiral is used to guide this analysis process, as each of the themes is examined individually.

The use of hermeneutics was inspired by the recommendations from Klein and Myers (1999) who present an excellent guide on how to conduct interpretive case studies in information systems and recommend hermeneutics as a useful form of interpretivist research. The Hermeneutic Spiral can be seen as the overarching principle of hermeneutic interpretivism where the movement of understanding is constantly from the whole to the part and back to the whole, in an attempt to increase understanding by refining and extending the themes emerging from the analysis. The harmony of all the details with the whole is the criterion of correct understanding. Although this process was followed in the full research process, this paper does not allow the space for a full discussion of the process. In what follows, only the results of the research are presented, namely the themes as they emerged by following the Hermeneutic Spiral research process.

The source materials are various written documents as well as in-depth interviews with many of the stakeholders involved with the MPPC.

THE EMERGING THEMES

Community Dynamics: The Power Game

The most consistent theme which emerged from all three rounds of interviews was the importance of understanding and handling community dynamics.

There was an obvious rivalry between the dominant community of the valley, Pniel, and the most isolated, rural community, Groot Drakenstein. This rivalry was aggravated by various factors, including the perception that Pniel was always the beneficiary of upliftment projects. Pniel was already home to the municipal buildings, the post office, the library and the most affluent inhabitants of the valley. So when the MPCC was also situated there, it was understandable that the other communities felt somewhat aggrieved. However, Pniel is situated in the middle of the valley, on the main road, making it the most accessible area and therefore the logical place to put an MPCC that is meant to serve the whole valley. As the project manager commented:

Now the problem that you have is that there is one prominent community, Pniel. It's on the main road, it's where the municipal offices are, it's where the more affluent people of the valley live, so they tend to look down their noses at the rest of the valley, make discouraging comments about them, according to where they live. And then the other communities comment on the 'uppitiness' of the people of Pniel.

As a result of this division between the communities, the MPCC ran into a number of problems. Many of the participants commented on people "boycotting" the centre simply because it was located in Pniel and not in their own community. There was a perception as one of the participants noted that, "Pniel's people don't let people feel at home."

As a result of these difficulties, which were caused by a small minority of people in the Groot Drakenstein community, the whole process was almost "derailed." It is hardly surprising then that when asked the question, "How would you go about implementing an MPCC if you were given the job of project manager?" almost all respondents said that community buy-in was the most essential aspect. Municipal officials, who were responsible for establishing the initial committee, were also unanimous that "community dynamics" was the most difficult aspect when it came to implementing the MPCC. One official went as far as saying, "I can honestly tell you that community—that's why they call it the Dwars River Valley—they [are] a bit 'dwars'. [T]hey try to be difficult and one can say stubborn or arrogant in some ways." ['dwars' is an Afrikaans word meaning 'across']

The MPCC as a Vehicle for Economic Development

From the interviews there was a distinct spectrum of understanding of MPCCs and their role in development between the different groups of actors.

The project manager, as could be expected, was very clear on how the MPCC operated and its role in enabling economic development in the valley. The four components of the MPCC, especially, the training and business advisory components strengthened by adding project management training, would build capacity for spin-off projects which would create economic development within the valley. The MPCC would be self-sustainable and would be able to support three full-time employees on its income.

Municipal employees also had a more flexible outlook as to what exactly an MPCC was supposed to be. "The beauty of the MPCC is that it's a vehicle for the community to drive up to whatever need they require from the municipality." Overall local municipal employees had a sense that MPCCs had some vague relationship to economic development but the dominant reason for implementing them was political: "It's being pushed by National and Provincial Government."

Participants had varying perspectives on what the MPCC was meant to achieve. Some saw it as a means to get cheap (or free) computer training and land a job. Others however, were more philosophical:

[B]efore the MPCC was here, we didn't take notice of anything around us…Now, my eyes have opened. I see quite a lot of things, a lot of opportunities…to explore. Because here was always a river but we didn't take notice of the river. Now we see that we can use it for fishing (as a tourist attraction).

Thus, to some participants the MPCC brought a new perspective, an awareness, of entrepreneurial opportunities that they didn't previously possess.

Computers Essential for Development

When asked about the role computers played in their projects the participants generally focused on the artefacts that could be generated by computers. A typical statement would be, "to be able to…type stuff up on the computer such as business plans and CVs."

Municipal employees saw computers as a completely natural advance to be made on the road of development. Their outlook was somewhat similar to that of a technophile in that computers were seen as an inevitable progression that should occur sooner rather than later. There was the perception of an urgent need to make up the "backlog" as illustrated in this quote from an official:

[I]f you look at industry, if you look at the business world outside, everyone wants you to work on a computer. And that's the way its going unfortunately and there is a big backlog of people not having access to these because of funds and economic problems that they have.

While the participants and municipal officials tended to focus on the artefacts that could be generated by computers, the project manager was more interested in the way that computers got people to think and work in a specific way.

Most of the proposals that we see at community level, are hand-written and they don't deal with the financial aspects properly. You get rough statements of 'We think we need R 200,000' but there is no budget or anything to justify this. With the computers the people were trained to do this properly… [I]t wasn't the case of technology looking for a cause; it was a case of putting technology in there because we need it. It wasn't a direct or indirect objective to get computers into the community, it was a given that these objectives are only possible with computer technology.

For the project manager then, computers enabled people to think in a more logical, structured manner. Computers were not an end in themselves, but rather a means to aid people to, for example, "deal with financial aspects properly." The project manager was less focused on the computers producing artefacts and more focused on the processes encouraged by using computers. Put another way, it was not the project plan that was essential, but rather the planning of the project.

The Internet: Source of All Knowledge

When asked about the Internet, participants were very quick to talk about the "ability to learn" about things on the Internet. But there seemed to be a lack of understanding as to what exactly the Internet could and couldn't do for people in development situations. There was an over-optimistic attitude that "anything you need to know" could be found on the Internet.

The project manager summed up the situation nicely:

People are very glib about what the Internet can do for communities, but their perspective is all wrong. You know 'you can get on the Internet and learn' is a glib statement that a lot of people make. You have to learn first to be able to learn on the Internet if at all.… [T]he people in the Dwars River area used e-mail extensively… [T]hey also went into electronic banking quickly, and made payments on a monthly basis to the participants of the projects… Initially, they also used the Internet extensively, until they saw the phone bill that came with it, so now they've cut down a lot. We taught them to create Web sites, so they were looking at other Web sites to get an idea.

Perhaps it is a bit premature to draw any conclusions regarding the use of the Internet in the DRV MPCC because the Internet has not been easily accessible with only the one line available. This lack of infrastructure has made it unfeasible to use the Internet extensively. However, there are aspects of use such as e-mail and electronic banking, which seem to have been taken up quickly and demonstrate that the Internet could be used effectively by participants. It is not yet clear if the Internet will be very useful as a tool for learning, particularly given the lack of relevant, local content available.

Funding is the Trigger

Funding was another crucial theme that emerged consistently throughout the interviews. The municipal officials were very much of the opinion that the funding should be once-off to get the project started:

"There is a perception of people on the ground level that it is one of the functions of provincial and national government to plough money into projects like this. I see that in a different light. The thing must be sustainable—absolutely—the money that comes from provincial and national government, must be a trigger type of funding…you can't forever pump money into a bottomless pit."

One of the main problems with the funding from the participant's point of view was that R 1.4 million worth of funding was promised to the project by the government HSRP fund. The bulk of this money was later withdrawn leaving only R 560,000 to build the new MPCC building. The reasons for the withdrawal were the change in project scope as well as the fact that the money was being used on more intangible aspects, the so-called "soft" issues rather than "hard" projects. The project manager described the situation as follows:

Initially it was very nice, we could jump in and use all the skills. Everybody got busy on the development of the valley and got paid out of the funds. We did a hundred and ten different things, all very well, the project management skills came to the fore, the PC skills came out, the business planning skills came out, and everything worked very well, until there was a hiccough with the funding… Overnight we had no funding for the project; we had no means to pay the people who were active in the project. Massive expectations had been created in the process, and we had to motivate why people had to hang on when all of a sudden they weren't getting paid. With the result that most of the people with other obligations went and found other jobs. So we ended up with 6 people remaining, hanging in.

Although the sudden withdrawal of funding did seem to interrupt the momentum of the project, it couldn't be blamed as the main reason for the difficulties encountered. The following two themes emerged mainly from the perspective of the project manager, but seem to add significantly to our understanding of the process of implementing ICTs in development projects.

A Confusion of Roles

Throughout the project there was continuous uncertainty with regard to responsibilities and roles. There was never a centre manager and so this role was automatically filled by the chairperson of the committee. The municipality already had an official who worked in the valley and his job description was extended to be an "overseer" of the project. However, none of these people got paid for what they were doing, because, no one knew who was ultimately responsible.

Hence a lot of responsibility suddenly shifted to the project manager. Although he came from outside the community, he was soon seen as an essential part of the project. There was enormous respect for him from most of the participants as well as from the municipal officials. He was often described as the "expert" but was also seen as a friend of the community. As one participant noted, "[He] can get in his car now and drive down to my sister's house and he will be welcome."

However, the strength of the project manager, and his ability to lead, seemed to become a pseudo-satisfier as it nullified the emergence of any strong local project leaders. After all, the explicit role of the project manager was to hand over the project to local people once they had been trained sufficiently to run the centre on their own. One of the participants described the situation well:

[The project manager] was the driver. [He] was the one who stepped on toes. [He] was the one who told you, 'I want that thing, and I want it now, not yesterday, now!' He is the one that pulled everything together. If he was not here then everything would fall apart. Not that we are not in control, everyone knows what they have to do in here. But he is the one, not with the ideas, we all have ideas, but he is the one that puts the action to the ideas and makes sure that things get done.

Thus, while the participants were continuously involved in every aspect, they never had to take responsibility for anything because they knew they had the project manager to fall back on. They knew that he would "make sure that things got done."

The project manager became the central actor responsible for everything from submitting monthly municipal

reports on the project, to managing operations, to securing funding from a number of sources. This leads on to the final theme, the passive/active struggle.

The Passive/Active Struggle

The major theme that came out of the reflections of the project manager was the struggle he underwent to get the attitude of the participants to change from being passive to being active. Participants can either be active or passive depending on the type of implementation approach they endure. Top-down approaches usually lead to participants being passive, while bottom-up approaches somehow create active participants. However, this does not seem to have been the result that was achieved in this case under study. Significant time was spent on community facilitation, and participants were given every opportunity to drive the project in a bottom-up manner. Yet, this was not enough to create active participants. The frustration of the project manager is clear when he says:

It just comes out as an attitude where, as a trainer in that situation, I have difficulty with instilling an entrepreneurial spirit because the entrepreneurial spirit just isn't there. You get to the point where you think that it can't be put there, even as much as you try, because you try harder and harder, but maybe somebody is born with entrepreneurial spirit, and you can't put it there through training. People like following instructions. They like the comfort zone of knowing how much they are going to earn for a specific task. They would prefer…somebody else taking responsibility for generating the income and then taking part of that.

This struggle forms the crux of the issue. Even if everything else went according to plan, this one underlying aspect could have (or would have) caused the project to fail over time. And according to the project manager, "You can't hope to start addressing social issues of that magnitude in a project of this nature. Where do you start?"

THE FUTURE

Towards the end of 2004, the project was in a precarious position. The remaining funding from the HSRP was being used to build a standalone building to house the DRV MPCC. The construction of this building should be finished in 2004, and many stakeholders had begun aligning their interests with the promises of the new building.

Is it possible to change the underlying difficulties described in the previous section? It is not inconceivable, for example, that the increased visibility, increased Internet access, and increased professionalism will lead to a change in the attitudes of the centre staff. However, in the view of the researchers this is unlikely to happen.

CONCLUSION

A first point for reflection is the role that ICT played in this case study. The study points to a pragmatic view of the role of ICT in development. Many studies in the literature brought attention to the fact that Western practices and concepts were inscribed into computers and that these were not suitable to third-world contexts. This view was not supported in the study. It was apparent that *under the right conditions*, the ICT worked well enough. Participants (even those with relatively little previous computer experience) found it easy to learn to use computers. Of course, significant training was required, but once this was completed, participants were able to produce project plans, budgets, brochures, Web sites and other artefacts. These artefacts were able to inscribe processes and practices and provided real benefit to a number of situations, including running a business, marketing products, and managing human resources.

A second point for reflection is the role of funding in such a development. The HSRP fund was of the opinion that development could be encouraged by establishing buildings. They refused to fund "soft" issues such as community facilitation, training and support projects. However, it is clear from the discussion that this narrow view is very dangerous. The success of community development projects is dependent on far more than just infrastructure. A community-driven project, especially a newly formed one, requires significant nurturing in order to increase the strength of its cohesion. This is not to say that community projects necessarily require continuous funding, but rather that they require holistic funding in order to foster their chances for sustainability.

An important point that emerged from the study was the active/passive struggle. This struggle seemed to be an important consideration for the long-term sustainability of the MPCC. Without "active" participants, the project manager was given the responsibility of being the "driver" of the project. One of the participants suggested that what was needed was a strong local actor who could take over from the project manger once the MPCC was sufficiently stable. Thus good support was provided by the study for the concept of a middle-out, local champion.

In terms of ICT in development, this project showed encouraging signs that ICT can indeed be of practical use in a variety of situations, but particularly in the area of supporting entrepreneurial development projects.

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KEY TERMS

Digital Divide: The gap between countries or communities with and without access to technology, usually because of a combination of economic, socio-political and historical causes. The differences relate to ICT infrastructure and human resources and skills, although it is usually used in the context of the inadequate Internet connectivity in developing countries or in underdeveloped regions.

MPCC: The Multi-purpose Community Centre (MPCC) is a telecentre which has a political motivation to aid in the upliftment of a disadvantaged group. Implemented by the USA (see below) it aims to provide one-stop access to government and other digital information. There is no standard configuration since, in principle, the MPCC is configured in response to community-defined requirements. Although the initial MPCC setup is funded by a consortium of national and local governments and the private sector, the MPCC is supposed to be fairly self-sustaining in the longer term—a difficult challenge in most cases. At the time of writing (early 2004), more than 50 MPCCs have been established throughout South Africa.

NGO: A Non-Governmental Organisation (NGO) is a voluntary, not-for-profit organisation, and hence sometimes referred to as a private voluntary organisation (PVO). Although it does not have to have a formal statute, it should be autonomous from the government. Generally, it obtains most if not all of its funding from private sources.

Telecentre: A shared, centrally-located community centre equipped with the necessary ICTs and manned by adequately skilled staff to allow the community members to connect to the global communications network (telephone, fax and Internet). Usually additional office-like facilities are offered such as photocopying, printing, scanning, and multimedia.

USA: The Universal Services Agency (USA) was established under the South African Telecommunications Act 103 of 1996 with the mission of promoting universal services and access to historically under-serviced areas. One of its most visible instruments is the establishment of MPCCs.

Satellite Technology in Schools

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INTRODUCTION

SchoolSat[1] was an initiative to utilise advances in satellite technology to improve access to the Internet for Irish schools. It was partially funded by the European Space Agency under the ARTES 3 Multimedia Programme and ran from December 2001 until January 2003. The purpose of *SchoolSat* was to set up, manage and evaluate a pre-operational, satellite-based service for compulsory schools in Ireland. It had as a clear objective and expected outcome: the establishment of a business and deployment plan for a fully operational and sustainable service for the Irish compulsory school sector based on a strategic mix of uni-cast and multi-cast services.

BACKGROUND

In most countries, the Internet is seen as a central component of an educational ICT strategy. It is seen as important for a variety of reasons. In part, the Web can be seen as a vast library of resources, some of which can be used by both teachers and students to enrich teaching and learning. There is also an equality dimension to the resource view of the Web, as the smallest and most isolated schools with no library can access exactly the same online material as the biggest urban schools.

The Internet may also be a conduit for a new generation of educational software. For decades specialist software aimed at schools has been produced however, despite the success of the educational software sector in the home and training markets, little of it is in use in schools. The use of software in schools may have been constrained by logistical difficulties including licensing, installing the software, etc. Many of these difficulties can be avoided if educational material is available online, providing an easier solution in school, one that students can continue at home, and teachers can explore in advance with ease.[2]

The need for Internet access in school also goes beyond the content of the World Wide Web. In part, "the medium is the message," as it becomes important for learners to develop information literacy. Negroponte, in his seminal book *Being Digital*, describes a "post information age," where individuals have much greater control of the information they receive and send, where they can communicate with agencies in a "place without space," and where they can control more of the information they receive.[3] This vision of a society with empowered individuals finding information as they need it and managing their own learning and information needs is an attractive one, but it is dependent on learners having the skills to deal with the vast amounts of material available to them.

THE SchoolSat PROJECT

The *SchoolSat* Pre-operational Pilot project used Internet via DVB (Digital Video Broadcasting) satellite technology with the KU band return channel for the establishment of the interactive channel. The aim of the trial was to investigate how far this technology could offer a solution to connect schools to the Internet, to build school networks and to transmit large files of information, be it data, video, audio, or graphics.

The planned service was based on the Digital Video Broadcasting (DVB) standard which is deployed Europe-wide (and is becoming accepted as a worldwide standard) for digital television. It allows the user to receive Internet services with a relatively small antenna (less than 1 metre diameter) and a PC (personal computer) equipped with a satellite modem anywhere within the footprint of the Eutelsat W3 satellite (used by the technology provider, Web-Sat[4]). This PC can be used as a gateway to connect multiple PCs to the Internet.

The 14-month project included the following phases:

- **Phase 1:** Set-up and orientation of end-users: December 2001-February 2002
- **Phase 2:** Pre-operational pilot phase: March 2002-December 2002
- **Phase 3:** Evaluation: March 2002-January 2003
- **Phase 4:** Business planning and deployment: September 2002-January 2003

The following schools took part:

- Gairmscoil Mhic Diarmada, a vocational school on the Irish speaking Arrain Mor island
- Gairm Scoil Chu Uladh, Bellanamore Secondary School
- Carrick Vocational School

- Loreto Community School, Milford
- Scoil Mhuire, Buncrana
- Abbey Vocational School, Donegal Town
- Loreto Secondary School, Letterkenny
- Carndonagh Community School
- Donegal Education Centre

SchoolSat was a direct response to the relatively poor level of connectivity to the Internet experienced by primary and secondary schools, despite the Irish Government's stated intention to provide every Irish classroom with a broadband connection to the Internet. Although it is true that throughout the developed world most schools have Internet access—(recent EU figures suggest that 90% of EU schools have Internet access, and this figure is growing all the time[5]), increasingly narrowband access is seen as insufficient for real educational use, and provision of broadband access is seen as a major objective for educational ICT policy. That is why in Northern Ireland, the current ICT strategy provided broadband access for all second-level schools. But although city schools are offered more and more choice according as ADSL services roll-out and competition drives costs down, the rural schools and schools in towns have too small populations to attract a competitive broadband offer. Despite the best efforts of all concerned, broadband access to the Internet in Irish schools remains considerably below European norms and there is a danger that Irish pupils will find themselves on the wrong side of a digital divide in terms of their access to and use of resources and opportunities afforded by fast access to the World Wide Web. Nolan Bowie notes, for example, that in the US there is a geographical dimension to the digital divide, with rural families less likely to have access to the Internet than urban families.[6]

From the service provider point of view, *SchoolSat* proved that putting a service like Web-Sat in a school environment was viable and provided a great deal of evidence as to the service requirements of a schools community. On average, each school transferred about 1GB maximum of data each month with a usage ratio of approximately 1:20, where each school downloaded about 20 times more content than they transmitted. Technical problems were minimal and to a large extent such a service can be expected to run trouble-free with the minimum of maintenance. Problems, where they occurred, had far more to do with connectivity into the schools LAN and local maintenance issues that they had to do with any difficulty to do with the satellite service.

Having said that, it is clear that in order for a satellite supported service to be viable, it has to be to a community of school users and is not a service that can be offered on an individual basis. In rather simple economical terms, it is just not viable to offer a service such as *SchoolSat* to individual schools as installation, maintenance, and service provision all require specific levels of buy-in to make such a service sustainable. Significant economies of scale can be called upon in order to build a reasonable business case, but without these, satellite service providers will struggle to offer a reasonable and long-term solution for Irish schools regardless of brash marketing campaigns.

This requirement for some form of centralised service provision is not all bad news, however, and another significant outcome from *SchoolSat* was that given schools' tendency towards predictable and pre-defined content, they are in a good position to benefit from the added value of satellite multicasting services. During the 12-month pilot in Donegal, it was evident that a great deal of Internet traffic was to a small number of Web sites. School communities tend to be conservative and inclined to visit the same sites, where quality, suitability of content and safety can be guaranteed. This means that a satellite-supported service that delivers a set of pre-described content to the local server is eminently suitable and one which can deliver significant economies of scale. To this end, Web-Sat and ATiT are now building a school multicasting offer within another ESA project which can offer end-to-end multicasting and caching services to schools aimed at maximising their use of the Internet and delivering safe and reliable content to the classroom using state-of-the-art technology. The objective behind the project, called *SchoolCast*[7], is to plan, design, implement and bring to pilot utilisation a content delivery system, whereby a variety of multimedia files (Internet, video, audio, image) can be multicast to 10 or more Irish schools using a two-way satellite infrastructure, and cache the files at the school server for fast local access. The pilot will also validate the service on high bandwidth terrestrial multicast networks through the collaboration of HEAnet.

The intention is to pilot test *SchoolCast* in schools in Ireland with a view to its take-up as a sustainable commercial service. Through the pilot the business case for such a service will be refined and elaborated. Key target clients include satellite service providers, educational stakeholder communities including national and regional school portals, ministries of education and government agencies, schools and educational content providers.

FUTURE OF THE PROJECT

In June 2003 the final report[8] was submitted to ESA, which includes the report on the pedagogical value of such a service as carried out by Dr. Aidan Mulkeen from the National University of Ireland, Maynooth. This report

describes the main activities and outcomes from the project and broadly concludes that the service is of great benefit to schools, particularly those in rural communities where opportunities for broadband access via means other than satellite are scarce. It also shows that putting in place a satellite service for schools is manageable and describes a service which ran relatively fault-free for more than one year. Although attempts were made to correlate the level of service with both size of school and pupil/PC ratio, it is apparent that the use of the Internet in schools is generally far more a function of teacher motivation, experience and expectation.

Meanwhile, *SchoolSat* has continued in Donegal despite the fact that the funding from ESA ended in February 2003. The service to the schools taking part continues due in part to the direct support of NCTE and more recently with the partial support of Údarás na Gaeltachta. This support has guaranteed the continuation of the Web-Sat service to the schools taking part until June 2004.

It is important to note, that since the end of the *SchoolSat* trial in Ireland in January 2003, the Irish Department of Education and Science has launched a significant initiative to provide over 4,000 schools in Ireland with a broadband connection. Given the advantages and feasibility of satellite technology as proven in *SchoolSat* to meet the connectivity needs of rural and remote schools, it is estimated than more than 60%[9] of these schools will require satellite connectivity of a similar type to that provided during *SchoolSat*. Roll-out is planned to begin in January 2005.

CONCLUSION

One thing remains clear, given the geographical spread of Irish schools with more than half located in rural communities or towns of less than 10,000 people and that is that satellite services remain the only viable way to offer broadband access to the Internet in the foreseeable future for many schools. While not cheap, the only way such services can be offered at an affordable price is for them to be offered on a reasonably centralised basis. Centralised purchasing and management has become increasingly popular with regard to ICT service for schools generally, hence the intention of the Irish Department of Education and Science to utilise HEAnet, the national Irish Higher education network provider to manage the forthcoming broadband schools service in Ireland[10]. Given the price of economic isolation and the need for balanced regional development, satellite technology offers a key opportunity to ensure that the schools' broadband service meets the needs of all Irish pupils and not just those in large cities.

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KEY TERMS

Bandwidth: The amount of data per second that can be delivered to your computer. A 56K modem has a bandwidth of 56 kilobits/second. The term bandwidth is also used in conjunction with data rate when discussing video.

Broadband: Broadband is a new way of connecting to the Internet that will ensure rapid access, faster download times and a better overall performance such as high-resolution, graphics and CD-quality sound. Broadband connections are sometimes also called "fat pipes" due to the substantial amounts of data they can carry compared to more tradional "narrowband" connections, such as a modem which delivers variable service quality with slow download speeds. A broadband connection can be delivered in several different ways: Cable, DSL, Fixed wireless and satellite.

Caching: Using a buffer within your own computer's fast memory to hold recently accessed data. It is designed to speed up access to the same data later.

Digital: Information represented as discrete numeric values, e.g., in binary format (zeros or ones), as opposed to information in continuous or analogue form. Binary digits (bits) are typically grouped into "words" of various lengths—8-bit words are called bytes.

DVB: DVB stands for Digital Video Broadcasting, the European standard for Digital TV. This standard provides a very high-speed, robust transmission chain ca-

pable of handling the many megabytes per second needed for hundreds of MPEG-2 digital TV channels.

LAN: Local Area Network.

Multicast: A one-to-many client/server connection in which multiple clients receive the same stream from a server. To receive a multicast, a client listens to a specific IP address on a multicast-enabled network, like tuning a television to a specific channel. In contrast, a uni-cast is a one-to-one connection in which each client receives a separate stream from a server. Multicasting is a technique whereby information is transmitted to a well-defined and controlled group of users on your network.

ENDNOTES

1   http://www.schoolsat.net/
2   OECD (Ed.). (2001). Educational Software and Digital Content. *Learning to Change: ICT in Schools* (pp. 37-55). Paris: OECD.
3   Negroponte, N. (1995). Being Digital. 164-169. London: Hodder and Stoughton.
4   Web-Sat technology is owned and supplied by Web-Sat in Ireland, more information from www.web-sat.com
5   EU data published online retrieved March 24, 2003 from the World Wide Web at: http://europa.eu.int/comm/education/elearning/wn2002_03/what2.htm#2a
6   Bowie, Nolan A. (2000). The Digital Divide: Making Knowledge available in a Global Economy. In OECD (ed.), *Learning to Bridge the Digital Divide* (p. 40). Paris:OECD.
7   http://schoolcast.atit.ie/
8   Reynolds, Sally. (2003). *Final report SchoolSat*. 13-14. Report to ESA.
9   Schools Broadband Connectivity Study, published by Datanet, Ireland in July 2003 and available here http://www.education.ie/servlet/blobservlet/sbpp_schools_broadband.pdf
10   For more information about how this will be managed, see http://www.heanet.ie/services/services.php?serID=122&subID=34

Schools–Based Community Networking in Uganda

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INTRODUCTION

Our NGO, Uconnect[1], is distributing hundreds of refurbished computers to dozens of mostly rural primary and secondary schools in Uganda, training teachers and students to set up their own computer labs, assisting them in getting connected to the Internet and guiding them to open their schools' labs to the parents and local community after hours on a fee-paying basis. We have attempted to develop each aspect of the project's operations in such a way that it is sustainable, scalable and reproducible. This article will describe strategies we have used in our quest to make the Internet available to the widest number of people, and point out bottlenecks that challenge us to overcome.

The article is aimed at NGO directors and project managers in Uganda and other developing situations who intend to set up a project that is largely based upon using Information and Communications Technologies (ICT) for enhancing development. It is based upon several years experience in running such a project in Uganda, and the lessons learned, many of them by trial and error. I hope that by writing about these experiences, others might avoid making some of the mistakes made here. However, it is important to understand that there is no "right way" and other approaches may be just as successful.

BACKGROUND

When the Uganda Connect team visited their computer lab in March of 1997, Mengo Senior Secondary had a dozen computers, mostly 486s running Windows 95, with some 386s on Windows 3.1-equipment they had received through the World Links[2] programme. The team urged the teachers and students to get connected to the Internet, and invited them to visit their demonstration lab at the Education Ministry Headquarters where one of the computers was connected by "dialup." Visiting ministry officials and their secretaries, proud to have mastered their electric typewriters, did not seem so interested in the new technology, but school leavers who heard about it by "word of mouth" came flocking in and queued on benches in the hall to get some hands-on experience.

During that period, there was a flurry of visits to our ICT training workshops by international aid agency experts, from USAID's Leland Initiative[3], AED[4], UNESCO[5] and IDRC's Acacia[6] project. "Telecentre" was the buzzword then, and we were invited by UNESCO to provide the training component for the Nakaseke Multipurpose Community Telecentre[7] (MCT) that would be set up in the heart of Uganda's Luweero Triangle. Our team would teach a group of 25 trainees in their mother tongue, Luganda, how to use ICT, with an emphasis on "hands-on" experience. The group included representatives from many backgrounds including teachers, nurses, agricultural research workers and farmers, businessmen and local leaders.

The Nakaseke MCT was an expensive experiment[8]. In this case, we wanted to try something similar yet less costly and more reproducible at the local level across Uganda. The Unimogs carrying the six refurbished computers and printer for the new telecentre drove in convoy the 200 kilometres to Hoima where the Bunyoro-Kitara Community Telecentre was opened on World Telecommunications Day in 1999. This happened at the local district's Teachers Resource Centre and the event was covered on national television. However, we'd made the mistake of donating the equipment for the telecentre. As a result, the telecentre manager struggled to come to terms with the idea that he would need to charge a fee to visitors for the use of services, ICT training, printing, etc. The telecentre operation and potential users could not pay their contribution for the electricity bill, much less pay for their dial-up access. The project was therefore not sustainable. A year later, in collaboration with the World Food Programme (WFP)[9], we set up another centre in the remote rural trading town of Kihihi near the border of the DRC, starting with a solar-powered laptop and portable printer, connected to Internet by HF radio modem[10]. We later provided five desktop computers to the centre, after it was connected to the Kihihi Hospital diesel plant-on condition that the manager agreed to charge a fee for services, and that he would eventually pay $150 for each of the workstations. He did not charge fees consistently, never paid for the computers or Internet services we provided, and the centre eventually ceased to function.

The main focus of early telecentre pilot projects seemed to be finding out how ICT would benefit developing country communities. Sustainability issues could be dealt with later. Now an increasing number of evaluative studies[11] marked out sustainability as a vital component to success. Third parties were assessing our own work in this area[12] and case studies were being presented[13] at international conferences. A concept of how to develop telecentre "cookbooks" would soon follow[14].

By late-1998 Mengo's lab was connected by dial-up access to the Internet, and *telnet* was the rage. Groups of students, wide-eyed with excitement, gathered around the one computer connected to the Internet. It would be another six months before our demonstration lab at the Ministry was connected by spread spectrum microwave, and another two years before our team would network officials at Ministry headquarters and connect them to the Internet. We could then begin our quest to bring the information revolution to the widest number of people in Uganda through its schools[15].

SCHOOLS-BASED COMMUNITY INTERNET LEARNING CENTRES: A GOOD PLACE TO BEGIN

The comprehensive list of strategies for bridging the digital divide presented in the DOT Force Genoa Plan of Action[16] begs the question, "Where to begin?" The plethora of expert opinion contained in the action plan seems to underline yet another divide: "the disconnect between on-the-ground efforts and policy-making processes" (Bridges, 2003)[17]. Uconnect has consistently taken a "bottom-up" approach[18], with its "on-the-ground" initiatives, such as our schools project. Yet as the report suggests, both policy reform and the associated initiatives in the field will be more effective through better interaction between the two. Our NGO has striven to implement policy, working in close collaboration with policy makers, education ministry officials, aid agency experts[19] and business partners, to find out from experience in the field what works and what does not.

In the first year of the project Uconnect distributed hundreds of computers to sixty mostly rural schools. The fees received by schools for the computers were paying for the expansion of the project, purchase and shipping of several more containers of equipment and staff stipends. Relatively poor rural primary and secondary schools were queuing up to purchase computers. The proliferation of computer labs at rural schools was a good first step, but making that technology a tool for socio-economic development required a more comprehensive approach[20].

A report[21] by the United Nations telecommunications agency lauds the efforts of NGOs for providing computers and Internet connectivity to 70 schools[22] in Uganda. Yet the promise to bring the information age to remote rural schools in this sub-Saharan country remains largely unfulfilled. Connecting rural schools to the Internet-and through those schools to the people in the surrounding communities-was still the bottleneck, and cost is the main issue[23].

AFSAT's I-Way VSAT[24], an adaptation of the Hughes Network Systems (HNS) DirectPC satellite solution connects a handful of select rural schools to the Internet. But with a U.S.$2,500 installation fee, such an approach is not widely reproducible. We needed to find a more affordable[25] solution that facilitated an easy entry for a significantly larger number of schools.

Uconnect helped to pioneer a variety of connectivity solutions in Uganda. In collaboration with local partners, Uconnect tested a hybrid low-cost connectivity solution using receive-only DVB satellite, with an uplink provided by an appropriate technology, such as GSM or CDMA data.

In the meantime, Uconnect started to distribute remotely managed servers to those select schools whose labs were already permanently connected to the Internet. The project also began to guide teachers and policy makers at those schools towards creating schools-based community Internet training centres by opening their computer labs to the parents and public after school hours, offering services for a modest fee.

Uconnect, in its attempts to make the Internet available to the widest number of people in Uganda, has had to address a number of issues to do with sustainability, scalability and reproducibility. Social entrepreneurship, training local managers and trainers, supervision and project management by e-mail and selecting appropriate technical solutions are among the strategies that are outlined in the points listed below:

1. Demonstration of ICT for education at the Ministry headquarters;
2. The provision of refurbished low maintenance workstations with the schools providing transport for taking delivery;
3. The installation to their own Local Area Networks (LANs) by students and teachers after receiving training at Uconnect workshops;
4. The involvement of partners to provide low-cost Internet connectivity;
5. The provision of low-cost, professional, no-maintenance remotely managed servers for schools;
6. The training of staff for management of schools-based, community Internet training centres; and
7. The management of projects by Internet.

1. Demonstrate ICT for Education

The Uconnect team of volunteers demonstrated to teachers, students and officials the use of ICT for enhancing education from their demo-school computer lab. Strategically located at Education Ministry headquarters in Kampala, head teachers visiting the Ministry were directed by officials to the Uconnect workshops where they were given a demonstration and received documentation about how their school could benefit from the project. Groups of 20 students and a teacher from nearby schools were invited to a three-hour introduction to ICT and server-enabled[26] computer labs, during which they used the server's local search engine, Librarian, to research a curriculum topic. Our team of volunteers sent SMS messages by the Internet to thousands of schools, with project updates, using the Education Management Information System database for its source of contact telephone numbers.

2. Provide Refurbished, Low-Maintenance Workstations, with Schools Providing Transport for Taking Delivery

Uconnect provided refurbished, low-maintenance workstations with software including an open source office suite[27]. Workstations were protected by software[28] that allowed students to experiment, download and install software, click on pop-up ads, etc. Yet, upon rebooting, the system reverted to its pristine newly-installed condition. Hence there was no need for Windows clean-ups, defragging-or resource-hungry anti-virus programs. Thus protected, the workstations acquired their low-maintenance status, greatly reducing the level of technical skill required for computer lab administration and significantly contributing to overall sustainability. Schools arranged their own transport for taking delivery of computer equipment from the Uconnect Schools project warehouse in Kampala, enabling the more rapid expansion of the project.

3. Students and Teachers Install Their Own LANs

Having taken delivery of their equipment, school labs were installed with stand-alone workstations until the school sent a teacher and several students to take a one-week Network Training Workshop (NTW)[29] from Uconnect. NTW trainees brought with them a floor plan of their computer lab, from which they designed their network layout, before cutting *Cat5*, crimping and testing their cables. After returning to their school to "pull Cat5," it usually took a few support phone calls to NTW trainers before networks were up and running. This method has now been proven to work, and has become another key component for scalability.

4. Partners to Provide Low-Cost Internet Connectivity

Uconnect has played a leadership role, working with local and international partners, in pioneering and demonstrating a variety of Internet connectivity solutions in Uganda. Some examples of such partnerships include:

- **1997:** HF radio data, with the World Food Programme (WFP);
- **1997:** GSM data, with Celtel;
- **1998:** VHF radio data, with SIL, adopted by the WFP for its DFMS+[30];
- **1998:** Microwave spread spectrum, with SwiftUganda (later AfricaOnline);
- **2000:** Networked education ministry headquarters, connected to Internet by microwave;
- **2002:** Fibre optic links, with MTN Uganda, Uconnect workshops connected by 3Com ISDN LAN modems;
- **2003:** Wi-Fi, Uconnect workshops, with Hewlett Packard (Europe);
- **2003:** GSM data, with MTN Uganda, using Ericsson FCT, allows grouping channels; and
- **2004:** "Receive only" satellite, in conjunction with a variety of technologies for uplink.

Providing low-cost Internet connectivity for rural schools computer labs has been a major bottleneck[31] as the cost of Internet connectivity in Africa, compared to G8 countries, has been so high[32] as to be morally offensive. Uconnect has worked with local partners to find the most cost-effective methods for connecting each school. At the time of writing we were testing a hybrid low-cost connectivity solution using receive-only DVB satellite with an uplink by an appropriate technology, such as GSM or CDMA data.

The innovative use of (Squid) caching by the server provides an efficient use of limited Internet resources with significant cost savings for schools, i.e., using the server's *Librarian* (see bullet 5), a large number of Web pages may be downloaded inexpensively over a DVB receive-only satellite link with a minimal investment in relatively expensive up-link time.

5. Provide Schools with Professional, No-Maintenance[33] Servers

Once a school's computer lab has been connected to the Internet, Uconnect can provide a server with an innovative Internet access system designed for primary and secondary schools. This can dramatically improve a school's ability to deliver fast Internet access to a large number of students, cost-effectively, regardless of the school's location. It provides the speed and superior functionality that makes the Internet an effective learning resource.

The server's local search engine, *Librarian*, allows teachers to order Web sites in recursive levels. A teacher will usually start by searching the server's Web cache for a suitable Web site, then order five levels of links, i.e., if the site has five links, and each of the links at each of the other four levels also has five links, one mouse click can order around 4,000 Web pages. Those pages, including multi-media, may take a day or more to download into the local cache, where *Librarian* organises the pages according to the Dewey Decimal System for easy access. Once downloaded, the Web sites are available to users at the speed of the local network.

Each student, teacher, parent or other member of the community is given a user account, that includes e-mail and a Web site. All work saved to the server, is backed up each night on a mirror drive that is bootable in the case that the primary drive has failed.

6. Train Staff for Management of the Schools-Based Community Internet Training Centres

Participating schools make their computer labs available to the parents and community out of school hours on a for-profit basis for a modest fee. Before taking delivery of their remotely managed server, school staff members (and/or parents and teachers association members) will have had to have successfully completed a training course given by Uconnect. In these courses, they learn how to administer the school computer lab, including the management of the lab as a schools-based community Internet training centre so that it continues to operate successfully, pays for itself and also earns money for the school.

7. The Management of Projects by Internet

Members of the team, especially team leaders, project coordinators, system administrators, secretaries and ac-

countants, regularly report to and consult with each other and with our management team in Europe. These people can then advise one another, ask for clarifications and generally keep one another working in a synchronised manner. This method of regular reporting and remote supervision, that we have called "e-management,"[34] has enabled us to catch problems and advise on action to take before they turn into expensive emergencies. This is another key component to scalability and sustainability.

FUTURE: SOONER THAN LATER

We now know from reports[35] that the rural poor spend a disproportionate amount of their earnings on mobile phone, call-time top-up cards, and also that they appear to have more disposable income than has been previously reported. Hence, experience with Uconnect suggests that when the people in rural developing countries discover how much more cost-effective the Internet is in meeting their information and communications needs, compared to the relatively inefficient and expensive mobile phones they now use, they will switch to the Internet and create a larger market of users. The question being put to service providers is no longer about whether or not there is a viable market for providing Internet services to people in rural areas, i.e., "to be or not to be connected," but rather "how to get them connected the sooner rather than later."

CONCLUSION

Sustainability, scalability and reproducibility are critical to the successful widespread proliferation of the Internet in developing countries, and this applies to any connectivity solution as well. The work with the Uconnect project in Uganda that offered rural schools Internet connectivity for their computer labs with a one-time installation fee of only a few hundred dollars instead of a few thousand, and monthly recurring fees of around $200 for entry-level bandwidth, found that after-school-hours paying clients have been able to discover the value of Internet technologies. Once demonstrated with personal experience, school policy makers should be more willing to invest in higher levels of service. As a result of the lessons learned from Uconnect calls for a strategy that involves subsidization of ISPs to provide an entry-level service at, or even below, cost to achieve an early penetration of a large untapped rural market. When the value of Internet services has been demonstrated at the community-user level, then higher levels of service can be sold more profitably. Schools-based community Internet training centres may then begin to proliferate.

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KEY TERMS

386, 486, PENTIUM: Series of microprocessors produced by Intel, denotes speed of the central processing unit (CPU).

Cat5: Category 5 Ethernet is the most common form of cable used for networking containing (four) twisted

pairs of copper wire, supporting data transmission speeds of 100 Mbps.

CDMA: Code-Division Multiple Access is a digital wireless technology, and a spread spectrum technology used in Uganda for wireless local loop. It supports data transmission effectively.

Defrag: A disk defragmenter rearranges the files stored on hard disk drives so that they are not spread over the surface of the disk, and so access to the files is faster.

DVB: Digital Video Broadcasting is a standard for sending and receiving digital information. It is used for transmitting television by satellite, and for "broadcasting" Internet.

Fibre Optic: A technology that uses bundles of glass fibre to transmit data at high speed by rapid laser light signal pulses. It can carry a much greater amount of data than metal cable.

GSM: Global System for Mobile Communication is the dominant digital mobile phone standard that uses SIM cards that subscribers place inside their phones. It supports data transmission as well as voice.

HF Radio Modem: A device for transmitting data between high frequency (HF) radios. HF has the advantage of transmitting over thousands of kilometres. Although the data throughput is relatively low compared to other frequencies, it is "free to air."

SMS: Short Message Service allows the sending of short messages to and from mobile phones, and by Internet.

Wi-Fi: A wireless network that provides high-speed data connections over short distances, allowing visitors with laptops to connect to the Internet at so-called "hot spots," such as airport terminals or cafes.

ENDNOTES

1 Uconnect was previously named Uganda Connect, a shortened form of the Uganda Connectivity Project www.uconnect.org
2 World Links for Development http://www.worldbank.org/worldlinks/english/html/uganda.htm
3 http://www.usaid.gov/regions/afr/leland/
4 http://www.aed.org/Regions/Africa/Uganda.cfm
5 http://erc.unesco.org/cp/cp.asp?country=UG&language=E

6 http://web.idrc.ca/en/ev-5895-201-1-DO_TOPIC.html
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[22] The majority of those schools would have been connected by simple (low throughput) dial-up.

[23] Jensen, M. et al. (2004, February). *Fair Access to Internet Report (FAIR)*. Wits University Graduate School of Public and Development Management, Learning Information Network Knowledge (LINK) & Research ICT Africa for the Open Society Initiative and International Development Research Centre. http://www.researchictafrica.net/images/upload/FAIR%2018.03.04%20v17.pdf

[24] http://www.schoolnetuganda.sc.ug/homepage.php?option=vsatproject

[25] Affordability is determined by relating pricing to income. Fair Access to Internet Report (FAIR), Mike Jensen et al, February 2004, http://www.researchictafrica.net/images/upload/FAIR%2018.03.04%20v17.pdf

[26] SchoolAxxess (formerly SchoolWeb) server. http://www.advancedinteractive.com/schoolweb/ Entry level servers are built on RedHat Linux using Pentium 4 Compaq.

[27] OpenOffice. Downloadable at www.openoffice.org/

[28] DeepFreeze. www.faronics.com

[29] The Network Training Workshop costs $100 for five half-day sessions (not including Cat5 cable), i.e., $20 per trainee for a teacher and four students.

[30] http://www.wfp.org/operations/communications/dfms.html A WFP job advert describes the then new DFMS+ http://wetnet.net/pipermail/seatcp/1998-November/001967.html

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Selling Singapore's E–Lifestyle Initiative to Late Adopters

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INTRODUCTION

Singapore's transformation to a knowledge-based, information and communication technology (ICT) hub in the Asia-Pacific region began in 1992 with *A Vision of an Intelligent Island (The IT 2000 Report)* initiative. This blueprint for Singapore's future was initiated by the government "to spread the use of computers in everyday life and ... to have all households ... linked to the Internet" (Kuo et al., 2002, p. 1). To achieve this goal, the government implemented five strategic themes: development of a global hub for business, services and transportation; improvement in the quality of life by using technology to reduce or simplify mundane activities; boosting the economic engine through pursuit of information and knowledge economies; linking communities locally and globally through a comprehensive information and communication technology (ICT) platform to support civic and social networking; and enhancing the potential of individuals through the use of Web-based learning (Chun, 2002).

In 2001, Singapore's vision was at a crucial stage of development. Both the percentage of households connected to the Internet (49.8%) and computer ownership (61%) indicated strong growth (IDA, 2002, pp. 1-2; see Figure 1). However, underpinning these figures was concern over the low percentage of Singaporeans (47%) who were able to perform online functions. This situation contributed to low usage levels and poor adoption of Singapore's broader e-lifestyle initiative by late adopters of ICT and associated e-services.

Responding to the challenge, the Singapore government launched the Infocomm Development Authority of Singapore (IDA) to coordinate the development and implementation of the National IT Literacy Program (NITLP) in June 2001. By providing non-IT literate citizens with basic computing and Internet skills, NITLP acted as a primer to increase adoption and diffusion of the e-lifestyle framework (Lim & Weber, 2004).

This study examines the communication strategies employed by IDA to market the social benefits of NITLP to late adopters of ICT. The study uses Salmon's (1989) social marketing approach, supported by Rogers' (1995) five characteristics of diffusion of innovations, as an analytical tool to understand how social marketing strategies worked to change the mindset and attitudes of target groups of homemakers, workers and senior citizens in Singapore.

BACKGROUND

Since 1998, Singapore has attempted to narrow the country's digital divide. Of the 1.1 million households, almost 50% have Internet access (see Figure 1). Furthermore, the rollout of the broadband infrastructure reaches 99% of Singaporeans with a penetration level of 17.7% at the time of launching NITLP in 2001 (One big e-family, 2002, L. 14).

In spite of the high level of awareness of e-lifestyle services, usage by Singaporeans remained low. For example, IDA's (2002) survey of households revealed that 92.4% of respondents were aware of online shopping, but only 21.1% had used online facilities (p. 2). In response, IDA set the twin goals of training 350,000 Singaporeans in basic computing and Internet skills by 2004 and achieving a 90% level of information communication literacy by 2010. To achieve these goals, the Singapore government spent $25 million on developing and implementing NITLP from 2001 to 2004 to target late adopters of ICT (One big e-family, 2002, p. L14).

Level 1 NITLP courseware is delivered as a seven-hour, three-module training program in four languages (English, Mandarin, Malay and Tamil). The initiative serves to: (1) equip citizens with basic computing and Internet skills essential for improving the economic competitiveness of the country; and (2) promote the integration of ICT into the daily activities of Singaporeans so they benefit from a fun and enriching e-lifestyle where each citizen has equal access to information and communication technology regardless of age, language, social background, or ability (One big e-family, 2002, p. L14).

Figure 1. Computer, Internet, and broadband penetration in Singapore (IDA, 2002, p. 2; Singapore broadband usage, 2003)
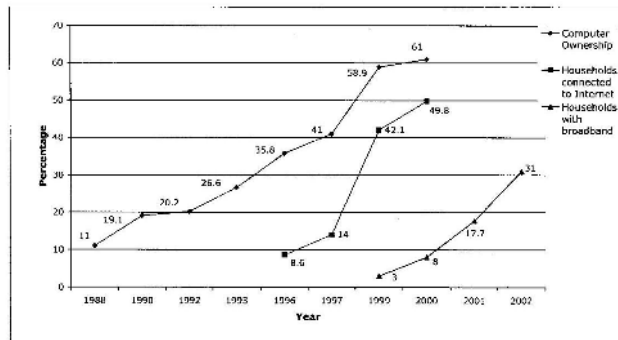
Within the first 12 months of the program, 80,000 Singaporeans completed the Level 1 training course. By the end of 2003, IDA had exceeded its target of 350,000 IT literate Singaporeans. During this same period, broadband penetration dramatically increased from 17.7% to 31%, a rise from 950,000 to 1.24 million (Singapore broadband usage, 2003). Usage of online information, interactive services and e-community participation facilities also showed increases of at least 10% across all categories within late adopter groups (Weber & Lim, 2003). Supporting these increases was a sophisticated social marketing campaign that persuaded late adopter Singaporeans of the core benefits of IT literacy in their daily lives.

THEORETICAL FRAMEWORK

Communication campaign strategists have embraced social marketing as a way of disseminating ideas and innovations within a social cause framework. A number of researchers (Zaltman & Kotler, 1971; Bloom & Novelli, 1981; Salmon, 1989; Weber, 1999) have contributed to understanding how marketing approaches work to promote social ideas and benefits. Central to social marketing processes is the notion that the objective of selling "commodities" is unlikely to succeed unless the essential conditions for effective merchandising exist, or are made to exist. The conditions are primarily that the audience be persuaded through adequate, appropriate and accessible social mechanisms. Thus, Bloom and Novelli (1981) suggest that the process of social marketing is "… the design, implementation and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communications, distribution and marketing research" (p. 79).

Kotler and Zaltman (1971) argue that social marketing techniques perform the role of a "bridging mechanism"

between the simple possession of knowledge and the socially useful implementation of what knowledge allows (p. 5). Therefore, a connection can be drawn between the marketing of an idea, innovation, or technology and the social acceptability of that product or service through investing it with some social objective or end. A number of researchers (Mackay & Gillespie, 1992; Kinsella, 1993; Weber & Evans, 2002) suggest that marketing plays a crucial role in the social shaping of technology because it can assist in constructing demand. Under the umbrella of modernization, the objective is to harness this symbolic encoding process, within the framework of a strategic marketing plan, to assist the introduction and assimilation of an idea, innovation, or technology into a society.

To achieve these objectives, Salmon (1989) suggests that the process of "social marketing employs mechanisms of social control … inculcation and modification of social norms—to achieve objectives of social change where these objectives are said to be in the interests of the individuals or systems being changed" (p. 20). There are two broad phases that define this process of social change through social marketing and related communication campaigns: *problem definition phase* and *implementation phase*.

Defining the social problem is divided into three steps. First, the communication campaign forms a social intervention that determines the situation as representing a problem in the view of a group or section of a community. Such a situation, as Salmon (1989) describes, can take the form of "some consumers … [are] unaware (but should not be) of some organization's service which may improve their lives; some social systems are insufficiently advanced or modernized (and should change) … or some government is being unresponsive to the needs of certain groups by failing to distribute resources in a manner a change agency considers equitable (so the government should alter its philosophy or allocation)" (p. 21). By defining situations in such a manner that projects the view that there is a "need for change" and then applying efforts to bring about that change, organizations or governments attempt to control change.

The second and sequential step is to consider the "definers of these problems." The ability to control the framing and defining of the problem is paramount to the success of the adopted "solution." Salmon (1989) argues that: "without doubt, the power resides disproportionately with government, corporations and other institutions possessing legitimacy, social power and resources and access to the media" (p. 25). From a government or political perspective, this change is undertaken so as to construct social, political and economic environments that prove beneficial in achieving certain social objectives. The third step of the definition phase combines the second step with the first to focus on the less tangible

elements of power. The power to define the problem inherits the subsequent ability to locate that problem in the domain of society to which efforts towards change will be applied.

Each of these sub-phases is rationalized during the implementation stage of the social change through several strategies. According to Salmon (1989), these strategies include: the freedom-enhancing qualities of certain change, the informative, rather than the dictatorial nature of campaign content, and the promotion of public and individual interests. These comprise the foundation for the process of planned social change through a strategy of persuasion not coercion (p. 30). By combining the central point of social marketing, whereby social objectives are promoted, with the symbolic encoding, there emerges a powerful, systematic and subtle strategy for selling technology under the guise of social objectives.

ANALYSIS AND DISCUSSION

IDA employed a three-pronged strategy of *Knowing IT* (information and communication literacy)*, Getting IT* (public access) and *Using IT* (e-services) to change mindsets and attitudes towards ICT and improve accessibility to Singapore's e-lifestyle. Supporting this framework was a communication strategy designed to portray NITLP as "an easy to pick up middle class" training course.

Communication Strategies

IDA's communication strategy operates at both micro and macro levels. Direct marketing, in preference to mass media, was used with posters and brochures distributed to Accredited Training Centres (ATC), libraries and community centres. Promotional activities endorsed by IDA were carried out at the discretion of training centres, which promoted NITLP aggressively within the community by offering awards to organizations that enrolled high numbers of trainees. ATCs also leveraged self-help groups and trade unions to encourage workers, and hard to reach segments of the society, to take part in the NITLP initiative.

When IDA employed mass media, newspaper advertisements were used strategically to promote specific nation-wide NITLP-related events. For example, IDA organized a 12-month *e-Celebration* program, including, communicating and promoting the e-lifestyle advantages at a broader society level. These monthly or bi-monthly promotions covered the four "e"s—e-Communications, e-Learning, e-Transactions and e-Entertainment. One such promotion, *The Great Singapore Surf* campaign, "reached out to workers, homemakers and senior citizens to demonstrate to them the importance of getting involved in an e-lifestyle" (Olby, 2002, p. 2). This campaign was built around

the messages of improving employability and the quality of life. The training was combined with an "IT Family Fun Fair" to provide an opportunity for trainees and families to gain hands-on practice within a supportive environment in which 800 volunteer e-Ambassadors were used as trainers and recruiters among friends and relatives.

Defining the Problem

While the use of NITLP as a primer to promote e-lifestyle adoption is strategically sound, operationally the task of persuading late adopters to embrace the training initiative provided a range of unique communication challenges for IDA. As Rogers (1995) suggests, late adopters are skeptical of new technologies and make less use of mass media to understand innovations. Accordingly, IDA's major challenge was to balance the macro use of mass media to position NITLP in the community and micro communication strategies to gain persuasive traction within target groups. This required the subtle building of a bridge between late adopters and NITLP. The strategy played down the initial *complexity* of the program, focusing on the *relative advantages* of IT training and its *compatibility* to cultural (i.e., family) and social values (i.e., nation). It also established opportunities to *observe* and *trial* ICT within controlled, supportive NITLP environments.

Rogers (1995) suggests that individuals measure the *relative advantage* of new innovations by perceptions of whether it assists their lives in economic, social prestige, convenience, or satisfaction terms. IDA's communication campaign promoted the *relative advantage* of NITLP on both economic and societal convenience terms. For example, *The Great Singapore Surf* campaign simultaneously targeted workers by offering NITLP as a way of upgrading skills for job promotion and for senior citizens and homemakers to simplify mundane activities such as banking, shopping and tax returns. IDA, however, continued to face the challenge of allaying the inherent fears these groups held towards ICT. This meant reducing the *complexity* of ICT training by exploiting the advantages of convenience, accessibility and low costs. Accordingly, training sessions were staged at a central location over three days, providing instruction in the four main languages at a minimal charge of $7.

Running concurrently with these strategies, IDA endorsed the *compatibility* of the training program to the key aspects of the prevailing value system. Historically, Singapore has invested significantly in creating a harmonious family of ethnic groups (Chinese, Indian and Malay), as a way of enhancing the quality of life and the country's economic stability, strength and global competitiveness (Kluver & Weber, 2003, pp. 377-378). Drawing from this strength, IDA utilized the theme of "family"

on national, community and individual levels. For example, media communication used the cartoon animated "Ang Family," of which each member reflected the various ethnic groups in Singapore, to depict the ideal model of a harmonious family living successfully within the broader e-lifestyle community. This socio-cultural motif was featured prominently in brochures, advertising (newspaper) and website communication in the *Singapore One: Living the e-Lifestyle* promotion. Accordingly Singapore's national newspaper, the *Straits Times* published a Special Edition *One Big e-Family* in April 2002, which used the slogan *Making Singapore: A Best Place for Family Life*. Within this communication, individual family values figured prominently with readers directed to websites such as www.AboutFamilyLife.org.sg and www.familytown. gov.sg, which focused on "Parenting and Grandparenting," "Healthy Marriages," "Family Activities & Events," "Get Married," "Care For Your Child," and "Experience Youth" (Olby, 2002, p. 2).

While these media messages introduced NITLP to non-IT literate people, interpersonal communication proved the most persuasive strategy among target groups. IDA's 2003 report indicated that individual testimonies of "friends and relatives" and "children" (combined) figured prominently in the way workers (59%), homemakers (50%) and senior citizens (49%) came to know about NITLP (Weber and Lim, 2003). Given these results, word-of-mouth acted to further stimulate peer discussion on NITLP by creating positive attitudes to IT knowledge and reducing anxiety levels among late adopters. The results support Rogers' (1995) observations that late majority adopters overcome skeptical views towards a new innovation by securing positive perceptions of its benefits through peer and family pressure. These perceptions simultaneously act to empower individuals by improving the quality of life and reinforcing the position of government as responsive to the needs of disadvantaged members of the community by redistributing the ICT resources to relevant groups.

Implementing the Solution

As Salmon (1989) suggests, the ability to control the framing and defining of the problem is paramount to the success of the solution. IDA's positioning of the government in redressing the ICT inequities within Singapore society and its access to the media reinforces the legitimacy of NITLP as an effective solution for bridging the digital divide. During the implementation stage, the problem-solution relationship was rationalized as beneficial social and economic change. When trained in NITLP, Singaporeans can "plug into a whole new world of knowledge and fun" where "anything's possible with broadband" (One big e-family, 2002, p. L14). This includes

access to online shopping, listening to music, watching movies, playing games, booking movie tickets, making travel plans, executing banking transactions, monitoring stocks and shares and paying bills. As Salmon (1989) suggests, the freedom-enhancing qualities of change and the informative rather than dictatorial nature of communication can combine cohesively to establish a powerfully persuasive tool that encourages target groups to try innovative ideas that benefit them individually and the nation.

The process of *trialability* is crucial to allaying adopter anxieties and uncertainties over technology training and the benefits it brings to people's daily lives. As Rogers (1995) suggests, new ideas that can be tried easily on installation will be more readily adopted. NITLP's delivery method countered expected levels of user anxiety and uncertainty by using e-ambassadors to establish a user-friendly, supportive framework. Consequently, more than 7,000 people registered for *The Great Singapore Surf* event.

Trialability, though, does not guarantee automatic adoption. The role of *observability* in the diffusion process is crucial. Observability extends beyond just the media's profiling of NITLP. It also relates to how users see the results of ICT training in their daily lives. IDA's 2003 report indicated that almost three quarters (72%) of the NITLP graduates increased Internet usage levels by at least two hours a week, while just over two-thirds (67%) increased usage of online information, interactive and e-community participation services and facilities by at least 10% (Weber & Lim, 2003). On an even more important scale, the positive perceptions in NITLP-trained late adopters stimulate further evaluation among peer groups through word-of-mouth communication.

CONCLUSION

Singapore set out to become the world's first to adopt a nation-wide e-lifestyle initiative using the NITLP platform to stimulate community involvement in the development of its knowledge-based economy. To achieve this, IDA employed social marketing strategies to increase the level of ICT literacy among late majority homemakers, workers and senior citizens. These strategies identified the core problem of the digital divide and then provided NITLP as the solution. The success of the campaign relied on knowledge of the communication behaviors and attitudes and common cultural values of target groups. Supporting this approach was a raft of broader mass media communication that created awareness among Singaporeans of the need for ICT training as part of individual and national development. The coordination of these micro and macro communication strategies assisted in playing down the initial *complexity* of ICT, focusing instead on the *relative*

advantages of training (employability and convenience), its *compatibility* to cultural (family) and social values (nation), while establishing opportunities to *observe* and *trial* ICT within a controlled, supportive training environment (user friendly). Further research, though, is needed on NITLP user groups to refine both the communication strategies used to promote training and the training program itself.

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KEY TERMS

Broadband: A digital delivery system using fiber optics to establish an interactive infrastructure that carries large quantities of interactive information.

E-Lifestyle: An online environment in which citizens have equal access to information communication technology (ICT) regardless of age, language, social background, or ability.

Interactivity: Interactivity is concerned with the engagement between the medium itself, whereby people manipulate the medium to provide information or perform functions commanded by the user.

Interpersonal Communication: This occurs in one-on-one situations or within a small group dynamic.

IT Literacy: A process by which people undertake skills based training in how to use information and communication technology (ICT).

Late Majority Adopters: A group within a social structure that constitutes people who have delayed the adoption of ideas, innovations, or technology.

Social Marketing: The design, implementation and control of communication programs calculated to influence the acceptability of social ideas and innovations.

Sociocultural Animation

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INTRODUCTION

The emergence of global computer networks and the widespread availability of advanced information communication technology (ICT) since the mid-nineties has given rise to the hope that the traditional disadvantages faced by regional economies and regional communities could be alleviated easily and swiftly. Yet, the experience of both researchers and practitioners in community informatics and community development tells a different tale. Although the potential of ICT is in fact realised in some situations and locations, and does provide a means to ensure sustainability in some regional communities, elsewhere it has not achieved change for the promised better. Too many communities are still faced by a centralised structure in the context of commerce, service provision or governance and by various degrees of digital divides between the connected and disconnected, between the media literate and illiterate, between young and old, between consumers and producers, and between urban and rural.

Many attempts to close or bridge the digital divide have been reported with various degrees of success (e.g., Menou, 2001; Servon, 2002). Most of these accounts echo a common voice in that they report similar principles of action, such as people-centred approaches, and they reflect and advocate—in most cases unconsciously—practices of sociocultural animation.

This article seeks to shed light onto the concept of sociocultural animation—a concept which is already commonplace in various forms in the arts, in education and professional development, youth work, sports, town planning, careers services, entrepreneurship and tourism. It starts by exploring the origins of sociocultural animation and draws comparisons with the current state of research and practice. It unpacks the foundation of sociocultural animation and briefly describes underlying principles and how they can be applied in the context of community informatics and developing regional communities with ICT.

BACKGROUND

Before the dominant meaning of the term "animation" was taken over by the film and computer graphics industries which 'animate' virtual characters, avatars and cartoons, it was—and still is—used to describe the act of encouraging, motivating, involving, empowering, engaging real human beings. The word derives from the Greek/Latin "anima" which means "life" or "soul" and thus stands literally for the act of giving life or spirit to someone or something, or the state of being alive.

Most current accounts of sociocultural animation trace its origin back to post WW2 France where "animation socioculturelle" "was discovered as a way of invigorating democratic values lost as a result of the occupation and other wartime hardships" (Kurki, 2000, p. 162). It has also been suggested that the French colonial heritage made for an invigorating environment in which previous traditions aimed at rather dubious objectives overseas could be re-purposed mainly to animate French youth for leisure activities in, e.g., "maisons des jeunes et de la culture" (youth and cultural centres), "centres sociaux" (social centres) or "maisons de quartier" (community centres) (Cannan & Warren, 1997).

The concept of sociocultural animation spread throughout Europe in the 1970s when the increasingly self-confident community arts movement (known as "neighbourhood arts" in North America) was first being recognised and taken seriously by the established arts institutions and by public cultural policy makers. Previously, two misconceptions were prevalent: First, art is not created by "the plebs" but by few highly talented artists who create cultural works of supreme value; second, cultural development will occur in society by simply exhibiting these works. Thus, conventional arts policy at the time aimed at the "democratisation of culture" by fostering the dispersion of cultural institutions such as opera houses, theatres, galleries and museums, and by funding professional artists only (Adams & Goldbard, 1990; for an American perspective see Levine, 1988).

Advocates of "cultural democracy" opposed these notions and—initially through the work of the Council for Cultural Cooperation (CCC), part of the Council of Europe (cf. www.coe.int)—introduced a broader notion of sociocultural animation to a wider political arena. Sociocultural animation was defined as all actions which are "concerned to offer each individual the means and the incentive to become the active agent of his own development and of the qualitative development of the community to which he belongs" (Grosjean & Ingberg, 1974, p. 4). The notion of

"democratising culture" was regarded as "patronising"; instead, the idea of "cultural democracy" suggests that "culture is synonymous with movement, and that each individual must not only be entitled to acquire culture, but also have full control over how that culture is defined" (Grosjean & Ingberg, 1974, p. 7).

Parallels can be drawn to today's information society which still tries to come to terms with the vast opportunities ICT offers and to find best practices to "democratise" ICT and internet access, effective usage and the role of government itself. The foundation of sociocultural animation holds some insights and opens up perspectives which present-day community informatics researchers and practitioners may find useful and may benefit from.

THE FOUNDATION OF SOCIOCULTURAL ANIMATION

Kurki distinguishes three dimensions of sociocultural animation: "The educational goal is personal development; the social goal is to reinforce the group and the community and to increase people's participation; the cultural dimension, in turn, aims at developing creativity and many-sided expression" (Kurki, 2000, p. 163). These three dimensions and their underlying principles and practices are explored in the following in the context of community informatics.

The Social Dimension

Anthropologists and sociologists have created a plethora of definitions for the term "community" with the only common term of reference being "people". The social dimension of sociocultural animation refers to a people-centred approach that is guided by the imperatives of personal and group participation (cf. Gumucio Dagron, 2001). In the field of community informatics, areas of application include sociocultural animation and ICT for developing countries (Gonzalez & Fernandez, 1990), communities of practice (Millen & Fontaine, 2003; Wenger, McDermott, & Snyder, 2002), and residential community networks (Foth, 2004), especially in the context of networked individualism (Wellman, 2001) and social networks (Watters, 2003).

The Cultural Dimension

Apart from the before mentioned prominence of sociocultural animation in European public policy making under the influence of the cultural democracy movement, it also implies a more simple and immediate cultural dimension in that it encourages people and community members to express themselves creatively through the arts. This dimension of sociocultural animation evokes the emergence of cultural heritage and gives rise to the formation of community memory. Smith (2002) illustrates the cultural dimension through the work of Brazilian theatre director and writer Augusto Boal and the "Theatre of the Oppressed" or "Forum Theatre" which is used as a way of developing creativity and eliciting an emotional response to political and economic questions from working class people.

Certain arts practices, especially dance, theatre and drama continue to play a significant role today in school education, youth and community work. One example of this use of sociocultural animation are the Rock Eisteddfod festivals in Australia (www.rock challenge.com.au) which combine choreography, costume and stage design, music and dance to animate not only youth but also parents, teachers and the wider community.

In the context of developing regional communities with ICT, the possibilities within the nexus of sociocultural animation and new forms of creative expression afforded by digital technology are just beginning to be explored. A prominent example in community informatics is digital storytelling which usually takes the form of a personal movie which integrates photographs, music, video, and voice (Freidus & Hlubinka, 2002). Digital storytelling workshops have been employed by both researchers (for a streaming media example, see Hartley, Hearn, Tacchi, & Foth, 2003) and practitioners (cf. www.bbc.co.uk/wales/capturewales).

The Educational Dimension

"Tell me and I forget, teach me and I remember, involve me and I learn," a proverb attributed to Benjamin Franklin, summarises the educational dimension of sociocultural animation.

From early misuse during WW2 where forms of sociocultural animation have been applied in Germany to develop a social environment consistent and favourable with the Nazi regime and ideology (Sunker & Otto, 1997), it has now found its legitimate place in the field of social pedagogy in Germany (Moser, Müller, Wettstein, & Willener, 1999) and other European countries (cf. www.enoa.de and Lorenz, 1994), including Spain (Ander-Egg, 1997) and Finland (Kurki, 2000). In France, sociocultural animation is well established as an independent profession of "animateurs" who work in various social, cultural and educational contexts (Augustin & Gillet, 2000; Gillet, 1995; Mignon, 1999).

Effective use of ICT in a community context often requires training. The educational dimension of sociocul-

tural animation and the existing body of experience in participatory action learning and community media may prove valuable to better communicate the possibilities technology holds for regional development. Digital storytelling workshops are designed to allow for creative expression, but at the same time community members learn to use technology and how to make technology work for them effectively.

UNDERLYING PRINCIPLES AND PRACTICES

Sociocultural animation is "a state of mind rather than a specific action, a matter of form rather than of content" (Grosjean & Ingberg, 1974, p. 8). As such, sociocultural animation is a framework which can contain any primarily people-centred practices or methodologies. These methods are almost always directed at activating or mobilising a group or community and the members of that group or community to:

1. Embark upon a joint discovery of their own situation and reality in order to create a critical awareness of the issues and problems found;
2. Analyse and diagnose reality in a dialogical fashion in order to envision the dream of a better future;
3. Find ways of changing and improving reality by means of self-reflection and action; and
4. Constantly and continuously evaluate and assess the context and purpose of the action in order to adjust goals and direction.

Sociocultural animation can take the form of and borrow principles and practices from participatory action research (Reason & Bradbury, 2001) or ethnographic action research (Tacchi, Slater, & Hearn, 2003), yet—due to its non-academic origins—animators have in many cases foregone the academic rigour required in favour of focusing on community action and change. This is in fact where synergies between academics and practitioners could emerge in the future: by combining the strengths of sociocultural animation—that is, activating and interacting with people—with the strengths of participatory action research—that is, analysing and interpreting reality from the different perspectives of community members with academic rigour. That said, the ethical rationale for a people-centred, solidary and democratic approach is very similar in both cases (cf. Hearn & Foth, 2005; Reason, 1998).

Sociocultural animation is usually employed by an "animator" (French, "animateur") who can be a neighbourhood artist, a youth worker or researcher from within the community or from outside the community. If the animator is already part of the community, the initial phase of immersion and orientation may be easier to accomplish, however, animators from the outside bring the potential of seeing the community reality in a fresh and unbiased light. The key phases that a sociocultural animator goes through comprise sensitisation/animation, facilitation and progressive redundancy (Thapalia, 1996); the latter phase is to ensure continuity of the action, so the community can carry on without depending on the ongoing presence of the animator.

The animator is a catalyst, a mediator and facilitator who seeks to raise self-awareness and motivation (cf. Csikszentmihalyi, 1997; Fogg, 2003), to build confidence to increase both self-efficacy and community efficacy (Carroll & Reese, 2003), to engage community members and to encourage them to participate in self-reflection and action.

Any kind of agile, adaptive and people-centred methods of practice and evaluation (e.g., Checkland & Scholes, 1999; Mumford, 2003) employed by a sociocultural animator need to work towards a holistic representation within the contexts of both the community and the individual. In the context of the community, it is imperative to ensure that it is not only the perspectives of selected community members such as the opinion leaders and their individual requirements that are heard and taken into account, but also the views of the community as a whole, in order to create a vision which is supported by the entire community.

In the context of the individual community member, "the only true source of knowledge is people's own social activity" (Kurki, 2000, p. 165). Hence, methods have to be applied that work towards capturing more than just explicit knowledge and also seek to elicit different types of tacit knowledge sources (Polanyi, 1966); that is, "from simple facts that were too obvious to be worth mentioning, to deeply ingrained skills that might be impossible to articulate, yet become visible through interaction" and creative expression (Foth, 2003, p. 35).

Table 1 is an attempt at creating a dichotomy of sociocultural animation as a heuristic aid based on two extreme types defined by Gillet (1995)—with additions by Kurki (2000) and Gilchrist (2000). These extremes oppose, yet at times also complement, each other.

CONCLUSION AND FUTURE DIRECTION

Ongoing issues and areas of discussion that are prevalent in the study and practice of sociocultural animation

Table 1. Cold world vs. hot world animation

"Cold world" animation	"Hot world" animation
Works to allay symptoms of problems	Works to remedy causes of problems
Instrumental use of ready-made methods	Reflective use of adaptive methods
Works towards social cohesion and consensus to retain the status quo	Works towards personal and collective participation to create conscious solidarity
Top-down approach	Bottom-up approach
Animation is 'social engineering'	Animation is 'human horticulture'

in the context of community informatics require further investigation and advancement. These include:

- The imperative of academic rigour in the work of sociocultural animators on the ground;
- The shift of emphasis in community development from "access to technology" to "effective use of technology" for creative expression, social networking and the generation of economic assets;
- Lack of clarity and guidance in the ambiguous nature of the animator who is usually employed *by* a funding body but employed *for* a community group; and
- Implications for public policy making and public funding programs in regards to the arts, media, ICT and community development, especially new definitions and practical interpretations of "accountability" and "sustainability".

Sociocultural animation holds exciting potential to be used in economic community settings. The social, cultural and educational dimensions of animation for ICT have already been exploited by businesses in what has been termed "viral marketing" (Godin, 2001; Goldsmith, 2002); however, its application for place-based social networking, community-led innovation and regional entrepreneurial initiatives is yet to be explored.

Kretzmann and McKnight point out that members of disadvantaged communities often "begin to see themselves as people with special needs that can only be met by outsiders. They become consumers of services, with no incentive to be producers" (Kretzmann & McKnight, 1993, p. 2). Far too often are regional communities given access to ICT without an existing strategy for how the technology can be effectively used to make sense in the lives of community members. Sociocultural animation

represents a key concept to overcome these flaws in that it regards community members as social beings, as creative content producers and active agents of change.

Finally, this is the time to embark upon the quest to sketch and establish a new adaptation of sociocultural animation that is purpose built for the opportunities and challenges of community informatics research and practice.

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KEY TERMS

Action Research: A research approach which is operationalised by constant cycles of planning, acting, observing and reflecting, which encourages the participation of local subjects as active agents in the research process, and which works hand in hand with people-centred research methodologies.

Animator: The "keeper of the vision" who is a catalyst, mediator and facilitator seeking to raise self-awareness and motivation, to build confidence to increase both self efficacy and community efficacy, to engage community members and to encourage them to participate in self-reflection and action.

Cultural Democracy: A set of related commitments to protect and promote cultural diversity, and the right to culture for everyone in society; to encourage active participation in community cultural life; to enable people to participate in policy decisions that affect the quality of their cultural lives; and to assure fair and equitable access to cultural resources and support. (cf. www.wwcd.org)

Sociocultural Animation: All actions which are "concerned to offer each individual the means and the incentive to become the active agent of his own development and of the qualitative development of the community to which he belongs" (Grosjean & Ingberg, 1974, p. 4).

Tacit Knowledge: We draw upon tacitly held knowledge to perform and act but it cannot be easily and explicitly articulated: "We can know things, and important things, that we cannot tell" (Polanyi, 1966, p. 22).

Viral Marketing: A recent contribution to the marketing mix that uses technical networks such as the Internet or mobile phone network, to start an epidemic that spreads an idea or message ("the virus infection") through social networks.

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South African Women's Rural Development and E–Commerce

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INTRODUCTION

Increasingly, social, economic, and political progress is linked with the ability of countries to make informed, knowledge-based decisions with ICTs performing an increasingly crucial role in many societies in this regard. While the potentially transformative nature of ICTs suggests an unprecedented opportunity to overcome existing social divisions and inequalities, the role of ICTs in development is suffused with contradiction and paradox (Morales-Gomez & Melesse, 1998; Marcelle, 2002). The panoply of recent technological innovation along with the convergence of content, computing, and telecommunications has created new and pervasive applications, such as e-commerce and e-marketing, all of which can impact significantly on organizational processes. While it seems to be a common a priori assumption that ICTs can "empower" individuals and increase levels of social interaction and civic involvement (D'Allesandro & Dosa, 2001), little effort, so far, has been made to understand both the changes enabled by the new technologies, and how they can be meaningfully applied to an African rural trading context.

THE RESEARCH NEED

Numerous sources (World Development Report on Poverty, 200l; UNDP Human Development Report, 2001) highlight the absence of research relating to the socioeconomic impact of ICTs, generally, and more specifically, relating to African rural women. Furthermore, there is little research focusing on the economic impact of the integration of ICTs with women's revenue-generating activities. Minimal empirical evidence exists to support the claims made for and against the use of ICTs, and much of the debate suffers from a lack of unambiguous evidence (Duncombe & Heeks, 2001; Heeks, 1999). In addition to this, as Montealegre (1999) noted, often the substantive issues relating ICTs to business processes are generally ignored and require better fieldwork to analyze the dynamic interplay between the social and the organizational settings in which the ICT is embedded.

The research model developed in this article aims to contribute to the attainment of ethical fieldwork procedures that appropriately and dynamically relate the use of ICTs in a particular socioeconomic context and for a particular organizational process, marketing. The case used in the research was the Rural Women's Association of Sekhukhuneland (the RWA). The RWA is a gendered not-for-profit, community-based organization located in the village of Apel, 150 km southeast of Polokwane, in the province of Limpopo, South Africa. Within four years, it significantly contributed to the eradication of both child malnutrition-caused mortality and hunger, and, in addition, generated a small income for some of its members. Despite this achievement, and despite the presence of ICTs, in the form of a government-sponsored telecenter, substantial economic growth and prosperity has eluded these rural communities, and access to markets has remained static (Rhodes, 2000).

METHOD SELECTION

Research method is performative, that is, it has effects, it makes differences, it can enact realities, and it can help to bring into reality what it discovers (Law & Urry, 2002). Different research practices make multiple worlds; these may be very unlike each other but be equally true and equally valid. This is so because the "real" is made within relations—real is a relational fact. We are observing what is exposed to our method of questioning, and new realities are created as they interact. In this way, reality is produced in dense, extended sets of relations. The selection of an appropriate research methodology needs to reflect the nature of the domain and phenomenon being studied, and research methods need to encompass the search for connectivity between the development problem, within an understanding of the social and political conditions (Arce, 2001). A "best-fit" research methodology, for this case, is required to satisfy the following conditions discussed below.

BEST-FIT RESEARCH METHODOLOGY REQUIREMENTS

First, methodology must be appropriate and ethically acceptable to the participants and the community in which they operate. Where research is contextual, local historical and sociopolitical information, and the national context in which the research is situated, is an essential component in acquiring authentic understanding. This is particularly relevant in this research study, as development here continues to be blighted by gendered, generational conflict. The "local" is embedded in complex relationships with other actors and forces, and in this case, there is a long and complex history of unequal power relationships and economic marginalization in which community local development processes are embedded. The research is sited in an area where the notion of equal rights for women conflicts with traditional customary law that enshrines existing social hierarchies and male privilege. Decades of violent repression and armed struggle against apartheid and colonialism have led to a culture of violence and witchcraft accusations, with witch hunts being one manifestation of this violence. Witchcraft is pervasive, and accusations are often an inherently political and gender oppression strategy occurring within the ambit of traditional authority.

Second, the selected methodology and research design must achieve the aims of the investigation, which in this case requires direct intervention in exposing and sensitizing the participants to concepts they are not particularly familiar with or may not know at all, such as e-commerce models and marketing concepts. This area of enquiry is complex, and very little is known about the use of ICTs to develop local rural economies. Furthermore, e-commerce and ICTs are emergent, highly unstable, immature, and not yet fully diffused. This scenario suggested the need for an interpretivist exploratory, interventionist research approach to develop a new body of empirical knowledge from which theories might be postulated at a later stage.

Third, for the research to be considered ethical, its design must advance the search for appropriate development strategies. Where research is situated in an underdeveloped sociopolitical-economic space, it often involves deliberate external intervention. Such a situation ethically demands that care be taken not to damage anyone and that emancipation be an outcome of the intervention. Research methodology that understands the local contextual social and political conditions and integrates them with local needs increases the positive consequence of development strategies. Implicit in this assumption is the need for authentic local participation in the study.

SELECTING RESEARCH METHODOLOGY

A starting point in selecting research methodology is to reflect on Meta theory. Meta theory (the philosophy of science or epistemology of science used to critically reflect on the nature of scientific enquiry) has particular notions of what the aims of social enquiry should be, and these notions lead to clear preferences for research methodologies and techniques. Three Meta theories (Positivism, Phenomenology/Interpretism, and Critical Social Science) have been clearly linked (Mouton, 2001) to the three major research methodological traditions (quantitative, qualitative, and participatory approaches) and are briefly reviewed below as an aid to guiding the decision of a best-fit methodology for this particular study.

Positivism considers that the social sciences and the natural sciences are similar enough to be able to use the same research methodology that is the use of quantitative methods to measure well-understood phenomena within a body of established knowledge. The lack of a stable body of knowledge discourages the choice of quantitative methods to structure prove/disprove research hypotheses. In this case, the research area requires openness, exploration, and discovery. This infers that the appropriate methodology to follow is qualitative.

With Phenomenology/Interpretivism, the aim of the enquiry is to understand (not to analyze or explain). The research participant is consciously and continually involved in social construction of his/her own reality that is contextual, personal, and subjective. Qualitative methods are used in this school of research to determine mental processes and perceptions in a variety of cultural settings and to understand how people meaningfully fit phenomena into their daily lives. Use of interpretivism is indicated as appropriate where there is no body of existing theory and where contextual meaning is required.

A further dimension of reflection includes the consideration of Critical Social Science theory, which aims to emancipate people from alienation through linking causal analysis with phenomenological investigation (that is, countering oppressive mental modes, for example, in this case, embedded superstition that uses witchcraft accusations as a causal explanation for trouble and misfortune in the community). The ultimate aim is to transform the relations of dependence and enlighten the social actors so they can view their social situation in a new and more beneficial way.

Participative action research (PAR) fits closely with the particular research requirements generated from the preceding analysis. Kemmis and Mctaggert (1988) defined PAR as "collective, self reflective enquiry undertaken by participants in social situations in order to

improve the rationality and justice of their own social practices" (p. 5). As an approach to research, it takes into account people's history, culture, interactional practices, and emotional lives, and actively involves members of the community in which the research is being carried out. It is a way of explaining a particular social world by working with the people who live in it in order to construct, explore, and improve theories about it so they can better control their well being. This facilitates the development of shared local theory through combining the different expertise and frames of reference of all parties. PAR falls within the umbrella of action research (AR) methodologies. An inclusive and encapsulating AR definition in the literature is from Hult and Lennung (2001), who assert that "Action research simultaneously assists in practical problem solving and expands scientific knowledge, as well as enhances the competencies of the respective actions being formed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understand of change processes in social systems and undertaken within a mutually acceptable framework" (p. 248). AR methodologies span a continuum of beliefs and assumptions as represented in Figure 1.

Implementing PAR means to cyclically plan, act, observe, and reflect more carefully, more systematically, and more rigorously than is usually the case in day-to-day living. The spiral nature of PAR (spiralling back and forth between the data and participants) ensures continual corroboration between all participants and the researcher.
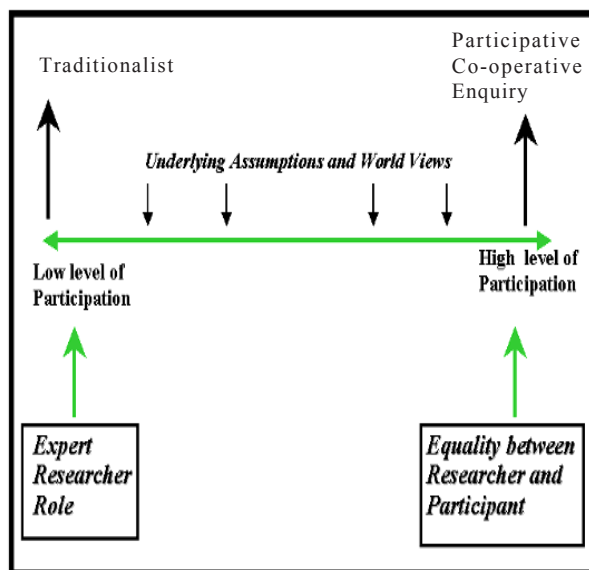
Potential communication misunderstanding can be continually identified and corrected, ensuring that the data validity is enhanced. This continual and rigorous cross-checking process allows participants to point out serious misinterpretations and errors in facts, ensuring a far higher standard of factual accuracy than could have been achieved by standard social research methods.

Kemmis and McTaggert (1998) and Brinton Lykes (1997) noted that some criticism of AR arises from situations where it has, perhaps, been used inappropriately. They proposed the following five conditions to counter criticism of the methodology: (1) it must be in a situation where people (participants and researchers) reflect and develop their own work and their own situations. (2) This experience is made public to other participants and other persons interested in and concerned about the work and situation. (3) The data gathering by participants is related to their own questions. (4) Participants engage in open discussion, are free to interrogate the data. (5) And, democratic decision making, power sharing, and self-management are evident in the process.

Alternate qualitative methodologies were considered, and rejected, for use in this research study. Ethnography was dismissed as inappropriate, as it is based on observation, and the intervention aspect of this research invalided this approach. Grounded theory was rejected, as it assumed that research subjects possess a prior understanding of the research subject matter, which was not the case here.

THE PAR MODEL

The participative action research (PAR) model used in the construction of this research model is premised on the McKay and Marshall (2001) paradigm. They assert that action research is more than a just a problem-solving method, and for it to work best and counter the preceding criticisms, it should be used from within a firm conceptual framework. In this way, actions to improve a situation are then part of an integrative strategy within which theories about a specified problem can be tested and refined. Figure 2 shows the PAR research model used here. Each part of the model is discussed briefly in the following.

Figure 1. The action research continuum (Compiled from Dickens, 1999; McTaggert, 1998; Mumford, 2001)

- **Step 1. Looking at interests and questions.** These are related to how ICT-supported marketing could address information gaps and blockages and inform and strengthen decision-making capabilities. The specific questions to be addressed included the following: Can e-commerce enable marketing in an African rural women's community-based development organization? How would the integration

Figure 2. The PAR model (Adapted from McKay & Marshall, 2001)
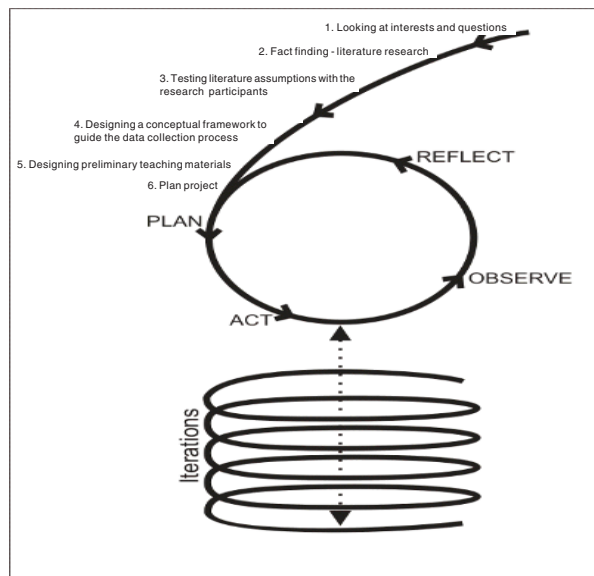
of e-commerce, marketing, and development activities in a rural African community enhance business transactions and result in greater profitability and growth?

- **Step 2. Fact-finding and literature research.** The above questions suggested the importance of the dynamic interrelationships between ICT, organizational processes, and marketing. A number of factors relating to the above questions were highlighted and explored through the literature research and then integrated into the research model as discussed below. The first factor to be considered was organizational process and ICT. The present understanding of the usefulness of ICTs is increasingly juxtaposed against a wider organizational change linked to economic activity. IT systems do not deliver sizeable benefits, unless they are part of an effort to introduce wider changes in the organization (Avgerou, 1998). At the community development level, Gurstein (2000) agreed with Avgerou, noting that while ICT is useful in overcoming distance sensitivity, the presence of electronic resources alone will not meet a community's needs if not linked to a particular activity such as marketing. Additionally, organizational change, such as the introduction of marketing, must be locally meaningful, not merely a transfer of organizational practices. Generally, organizational development practices are predominantly informed from within the Northern Hemisphere private business sector and are not often successfully transplanted outside of this context.

The second factor is related to marketing and ICTs. Marketing weakness was identified as a major constraint to expanding economic activity in rural African areas (Phororo & Prasad, 1996; Sotshongaye & Moller, 2000). Literature review (Kotler, 1980) demonstrated that planned marketing activities can enhance product and service development, and that while deviations from perfect competition leads to measurable welfare and consumer losses (Thompson & Sonker, 1997), ICTs can affect almost every structural characteristic of these markets and improve economic performance by reducing transaction costs and market thinness. The e-commerce literature suggested potential benefits of cost efficiency and productivity gains. Electronic business transactions can enhance business efficiency through lowering transaction and agency costs, widening market access potential, increasing richness and reach, better meeting customer needs, and hence, addressing the problems of market thinness (Cunningham, 2000; Timmers, 2000; Turban et al., 2003; Rappa, 2001).

- **Step 3. Testing literature assumptions with participants.** Case research along with a pilot study (Rhodes, 2000, 2002, 2003) shaped the design of the model as outlined in step 4.
- **Step 4. Designing a conceptual framework to guide the data collection process.** Figure 3 below outlines the model used to direct and guide the data collection and resulted primarily from the analyses conducted in steps 1 to 3.

The conceptual framework design acknowledged that none of its three different components, namely, marketing, e-commerce, or development could be considered separately, as all three perpetually acted on each other to evolve into a pattern that reflected the interplay between them within a particular con-

Figure 3. The conceptual framework
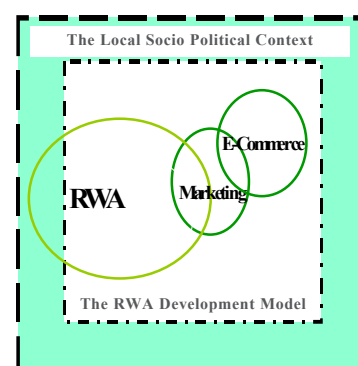
Figure 4. The data collection process
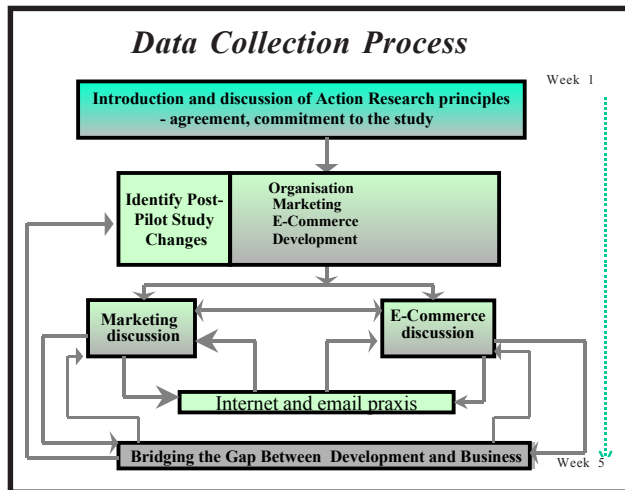
text. Full details of the conceptual model are found in Rhodes (2002).

AR is an emergent methodology in that its content and data are informed by previous cycles. This is achieved by moving iteratively backwards, forwards, and sideways through cycles of data content. Method, data, and interpretation and action develop simultaneously and from cycle to cycle. Figure 4 shows the data collection process, designed to incorporate the necessary functions of data iteration, cycling, and, reflection.

- **Step 5. Designing preliminary teaching materials.** As the intervention required a measure of learning facilitation, some preplanned teaching materials were designed to introduce and expose participants to development, marketing, and e-commerce concepts. These materials were deliberately kept rudimentary, as the materials were to develop organically throughout the course of the interventions.

- **Step 6. Plan the project.** The last and sixth step of the model, planning the project, integrated all previous steps and, in addition, included a research schedule (timing and duration) and a list of preliminary questions with which to start the research. After this stage, the project was initiated and iteratively followed the circle of plan, act, observe, and reflect (Figure 2) throughout the duration of the data gathering.

CONCLUSION

As ICTs have evolved, so too has the need to understand the human context in which they are embedded. This trend has led to the increasing focus on determining the most

appropriate methods for studying this phenomenon. While there is a growing consensus that qualitative methods offer important benefits, researchers are grappling with understanding what the most appropriate qualitative methods are and how to use them practically in addressing their particular research problem. These complexities are compounded when researching in a socioeconomic development context, with its concomitant requirement for ethical and empowering dimensions within the research model. The literature has limited examples of how to develop and design a rigorous research model that authentically and ethically addresses the sociopolitical context in which the phenomenon is situated. This article has outlined a process used to develop an ethical model of qualitative research that can be adapted by other researchers to fit with their particular context.

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KEY TERMS

E-Commerce: Doing business electronically, including buying and selling information, products, and services over a digital infrastructure via computer networks.

Information Communication Technologies: A range of goods, applications, and services used for producing, distributing, processing, and transforming information, including telecommunications, television and radio broadcasting, computer hardware and software, computer services, the Internet, electronic mail, and electronic commerce.

Market Thinness: Also known as market imperfections, it occurs where the structure of the market (i.e., low trade volumes, few buyers and sellers, scarcity of market information, barriers to entry) inhibits or prevents prices from attaining the relationships that characterize perfect markets.

Marketing: The set of tasks and business activities with which to find and stimulate buyers to consume the firm's output through the relationship between producers and consumers and the central notion of an exchange between participants.

Participative Action Research: A collective, self-reflective enquiry undertaken by participants acting as equals (and not researcher and subject) together in social situations in order to improve the rationality and justice of their own social practices. Conducting PAR is to cyclically plan, act, observe, and reflect more carefully, more systematically, and more rigorously than is usually the case in day-to-day living.

Sustainable Development: Sustainable development is connected to the ideal of improvement achieved through self-reliant human scale development that flows from the individual level to the local, regional, and national levels, and that is horizontally interdependent and vertically complementary.

The South Australian Common Knowledge Community

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INTRODUCTION

Online communities can have useful international dimensions because of the very nature of the World Wide Web's networking capabilities. However, while developing our South Australian community services and practice requirements, we have found a definite tendency in people that they "like and stay with their own kind." Much of the literature examining the uptake of ICT in community has found that local content is a vital issue. Why? It has been widely demonstrated that local Web sites developed locally provide ownership where an international or national Web site often fails. Another key success factor in the local use of Web sites (in fact, any Web site) has been found to align with whether the development was born from "a need" within the community, i.e., the community has the need and requirements and then provides input, takes ownership of output, etc.

The primary goal for the South Australian Common Knowledge Community Project was to provide a single access point for South Australian communities to share information and improve knowledge, therefore, raising awareness about the community-services sector in South Australia, as a whole.

Community Information Strategies Australia Inc. (CISA Inc.) was established in 1981 to manage the South Australian Directory of Community Services and provide support to the state's community-services sector in information provision. CISA is generally accepted as the major body in community information services in South Australia and maintains the community information standards policy.

CISA Inc. has made it possible for the sharing of community-services information through its printed directory, in-house software product, Infosearch, and its associated online version, Infosearchweb (www.info searchweb.com).

The South Australian Common Knowledge Community Project offered public and community-service providers alike, an abundance of information pertinent to them via a single access point (www.commonknowledge. net.au).

The project aimed to achieve its primary goal by encouraging community-services organizations to coop- erate in a partnered approach to information management. Traditionally, this included general community-services information; however, the project was to undertake the online capture of associated event and news information as well. The project also undertook to ensure that information maintenance, presentation, and dissemination was addressed. In this process, a framework of standards and guidelines for each of these aforementioned steps was introduced.

BACKGROUND

Our information-rich society is being overloaded with options: ergo, a dependable, single community news and information access point was needed.

At the time of project proposal and business case development, sourcing specific information was an arduous task within South Australia. Under such a scenario, an organization, member of the public, funding body, or MP wishing to obtain more information about the community sector or an individual organization within the community sector, they would be faced with a large task of researching a large number of Web sites, newsletters, pamphlets etc. Given the complexity, lack of cross-referencing, the different forms of presentation of this material on the Web and the time involved, many people seeking information would simply give up in frustration. This situation severely limited the South Australian community-services sector's ability to publicize its capabilities and achievements effectively.

THE PROJECT

The South Australian Common Knowledge Community project provides the community sector with a common platform for communication and knowledge building for both stakeholders and the general public.

The primary goal of South Australian Common Knowledge Community was to improve information sharing, thus creating an enhanced general awareness of the

community sector, and the sector's achievements within South Australia.

The project achieved this by encouraging organizations to cooperate in a shared approach to news and information management that included online capture, maintenance, presentation, and dissemination. After an initial pilot project, funding was received from Community Benefit SA to launch the project throughout South Australia. The project development essentially integrated two existing public information services: *Infosearchweb* (the South Australian community services directory) and *Eventspool* (the South Australian "what, where, when" event listing service), with the new "Common Knowledge" news and information service, or *CK News,* creating the overall South Australian Common Knowledge Community.

As larger community-services organizations typically had some form of existing pamphlet or newsletter through which they distribute their information, the transition for them was relatively easy, as Internet access was generally readily available. The dilemma for smaller community-service organizations contemplating whether they needed a Web site or newsletter (knowing that it would cost money to establish, time to maintain, and pressures to deliver) was solved by offering this free service.

With access to the South Australian Common Knowledge Community, organizations could achieve most of their communication goals without a Web site; they simply lodged any new material with *CK News* or *Eventspool*, through a simple, standardized online system. The local Web site presence developed in this manner, provided a sense of local ownership where an international or even (Australian) national Web site could not. The Common Knowledge Community Project offered the South Australian public and community service organizations an abundance of information pertinent to them through a single access point.

Time-poor people from both the business and community sectors in South Australia were able to benefit from interacting through the single Web access point to gain entry to information about all the relevant community

services on offer through South Australia. In particular, it gave all users specific information about community organizations, including contacts, activities, and operational strategies.

The entire service was provided free of charge to the general South Australian community and commerce and community-service organizations and groups to ensure no organization was disadvantaged. The benefits brought to these groups by the project included the following:

- Easy access to information for the public and community-service organizations
- Equal standing and promotion online for all community-service organizations
- Avoidance of the need for community organizations and groups to afford or manage their own Web sites, through using *CK News* and *Eventspool* to cover most of their online information dissemination needs, i.e., contact details, what's on, and organization reports
- Establishing standard practice for community news, events, and information for dissemination, i.e., via e-mail to registered subscribers
- Distribution of community news and information to a broader community audience, providing better promotional opportunities

CONCLUSION

The Common Knowledge Community Project promotes the community sector as a whole while saving individuals time and effort.

The overall project resulted in raised awareness and the profile of the whole of the South Australian community services sector. It also provided time-poor people and those with limited online skills the ability to swiftly and efficiently source much more specific information about South Australian community-services organizations.

The State of Internet Access in Uganda

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INTRODUCTION

In recent years, Uganda has witnessed an astronomical growth in the information and communications technology (ICT) sector. For example, between December 1996 and December 2003, the number of cellular phone subscribers rose from 3,000 to 777,563, Internet subscribers grew from 504 to 7,024, Internet Service Providers (ISPs) increased from two to 17, and public pay phones increased from 1,258 to 3,456 (UCC, 2004).

The late 1990's witnessed the proliferation of private and public initiatives to get more Ugandans online. Private entrepreneurs established Internet or cyber cafés in several parts of the country-mainly in major cities and towns—and the government and international development agencies started several public projects, such as Multipurpose Community Telecentres, aimed at increasing universal access to ICT. By December 2003, there were at least 24 registered cyber cafes in Kampala alone and four telecentres were operating at Nakaseke in Luwero district, Buwama in Mpigi, Nabweru in Kampala, and Kachwekano in Hoima district (Mwesige, 2004; Mwesige & Lugalambi, 2003).

This article examines the prospects and problems of Internet use and access in this East African country, focusing on the users of the two major public access points: Internet cafés and telecentres. While more Ugandans are getting online, the risks of exclusion of large sections of the population from the information society may still remain. Recent initiatives to address the digital divide between the industrialized countries of the "North" and the developing countries of the "South" may have improved Internet access in Africa, but they also appear to have created growing national digital divides within the region.

BACKGROUND

The Internet has come to be viewed as the epitome of the future global information infrastructure. Not only is the Internet now considered an integral part of national information infrastructures, it is also regarded as a valuable tool in the improvement of education, health, as well as governance (Braga et al., 2000; Wei, 1999).

An ever-increasing body of academic and policy literature proposes a strong correlation between Information and Communication Technologies (ICT), such as the Internet, and development (Braga et al., 2000; Rodriguez & Wilson, 2000; Rogers & Shukla, 2001). For instance, the United Nations system has declared that "the introduction and use of ICT and information management must become an integral element" of its "priority efforts to promote and secure sustainable development for all" (Hilliard, 2002). Several other international agencies as well as national governments have also embraced the objective of establishing "universal access" to ICT for all.

In Uganda, the recent liberalization and deregulation of the telecommunications sector broadened access to ICT. In line with its broader policy of liberalization and privatization in the early 1990's, the Ugandan government liberalized the telecommunications sector in 1997, following the enactment of the Uganda Communications Act. The new legislation sought to "develop a modern communications sector" by, among others, "enhancing national coverage of communications services and products; expanding the existing variety of communications services available in Uganda to include modern and innovative postal and telecommunications services; introducing, encouraging and enabling competition in the sector through regulation and licensing competitive operators; and establishing a fund for rural communications development" (Uganda Communications Act, 1997, pp. 8-9).

Uganda has since registered stunning progress in increasing access to telephony in recent years (Shanmugavelan & Warnock, 2004, p. 18). Although telephone penetration still remains low, a recent study found that a majority of Ugandans, 81%, now use telephones-especially cellular phones-regularly (McKemey & Scott, 2003, p. 4).

Unlike the tremendous growth, especially in cellular telephony in recent years, there has been no such dramatic increase in Internet access and use. The most recent available figures indicate that Internet users rose from 600 in 1995 to only 60,000 in 2001 (Uganda Communications Commission, 2004; World Bank, 2004). McKemey et al. (2003) also found that less than 10% of Ugandans had regular access to the Internet. This is disturbing not least because much of the success of ICT

as the engine of growth in the new information economy depends on affordable near-universal access (Rao, 1999), particularly to the Internet. While basic telephony eases personal and business communication, access to the Internet promises additional benefits, especially the delivery of vast amounts of information and a broad array of electronic services.

Numerous projects such as Internet kiosks, cyber cafés, and multipurpose community telecentres that have been launched in developing nations are often touted as the harbingers of universal access to the Internet in countries where there are still too many barriers to access from the comforts of home or the workplace (Minges, 2001; Rao, 1999; Rogers & Shukla, 2001). Although Uganda has made some progress on this front in recent years, especially in terms of improving the basic telecommunications infrastructure—wiring up, as some call it—current Internet access indicators are still poor by international standards.

INTERNET ACCESS AND USE

This article on cyber cafés and community telecentres in Uganda suggests that the ICT revolution remains largely a preserve of educated sections of the population with the disposable income and cognitive wherewithal required to take advantage of the available electronic information and services (Mwesige, 2004). The majority of the population is still excluded from the new electronic frontier mainly on account of socio-economic factors (Mwesige, 2004; Mwesige & Lugalambi, 2003). Public Internet access in Uganda is still not in what Lee (1999) calls "the realm of the educationally and economically disadvantaged" (p. 346).

According to a survey of Internet cafés in Uganda, the typical user is a single male, who is under 30 years of age and has completed high school at the very minimum. This user not only has the disposable income required to have access, but also the requisite requirement of the English language, which remains the language of the Internet in Uganda as in many developing countries, and at least some knowledge and awareness of ICT (Mwesige, 2004).

A majority of Ugandan cyber café users appear to be already advantaged in terms of access not only to the Internet, but also to other ICT infrastructure such as computers and telephones. For example, 66% of the respondents had access at the workplace, 68% had and used computers at the workplace, and 77% said they had mobile cellular phones. In many cases, cyber café users had also had some prior exposure to the Internet, either at school or the workplace (Mwesige, 2004).

Use of the Internet by elites is not limited to cyber cafés. Collaborative work on Ugandan telecentres also suggests that these public facilities mainly benefited a small class of educated citizens in their communities (Mwesige & Lugalambi, 2003). Potential users of the telecentres, farmers and petty traders who have had little or no formal education, not only stayed away from the facilities, they were in many cases not even aware of their existence. (Also see Minges, 2001.)

These data suggest that the Internet is still an elite phenomenon in Uganda. Such evidence seems to contradict utopian definitions (Rao, 1999; Wakeford, 1999) of Internet cafés and community telecentres as public access points for "ordinary people." While these facilities have become principal access points for most Ugandan Internet users, the people who frequent them are by no means ordinary. In fact, according to some observers, public access points have created "the same sort of 'digital divide' that they were supposed to overcome" (Minges, 2001, p. 26).

Despite the glaring online inequality, the improvements in recent years are still worth celebrating. At least, public access points such as cyber cafés and community telecentres have opened opportunities for those who are able, mainly on account of income and knowledge, to take advantage of the services they offer. While only small advantaged sections of the population have access, these cyber elites sometimes share information with and act as proxies for others in the community who do not have access.

Barriers to Universal Internet Access

Perhaps the biggest barrier to Internet penetration in Uganda, as in the rest of sub-Saharan Africa, is the dearth of telecommunications hardware and infrastructure, which is crucial to connectivity. Despite the recent growth in telephony, there are only three telephone landlines per 1,000 people and about 32 cellular phones per 1,000 people. Computer penetration also remains low, with only about three computers per 1,000 people (Uganda Communications Commission, 2004; World Bank, 2004). Moreover, most of this hardware remains in the capital, Kampala, and a few major towns and urban centers.

Moreover, ICT costs remain very high. For instance, on average cyber cafés, which have become the principal access point for most Ugandan Internet users, charge the equivalent of U.S. $1 for 30 minutes. In a country where about 40% of the population lives below the poverty line, and where the average annual personal income (per capital GDP) is only about U.S. $300, only an economically advantaged minority can afford the costs associated with getting online.

Knowledge and awareness also remains a barrier to Internet access. As Bucy (2000) argues, "social access" or the know-how engendered mainly by education and training is "vital for utilizing information technologies in ways that enhance professional practices and social life" (p. 54). Many potential Ugandan Internet users still do not know about the opportunities and possibilities offered by this medium. In fact, even a majority of those who have some access to the Internet do not appear to use it optimally. Most users engage mainly in personal communication, using free Web-based e-mail and chat forums. Research, information searching, and online news consumption are still limited, while e-shopping is almost nonexistent. Admittedly, many of the hindrances to optimal Internet use are beyond the direct control of the users. For example, many keen Internet users are frustrated by the dearth of local content and information relevant to their needs. Similarly, absent an efficient financial market, credit management system, and a streamlined national individual identification system, local e-shopping is still not viable (Mwesige, 2004).

Electricity supply also remains a major problem for Internet access. Some parts of the country still do not have access to electricity and power outages are rampant even in the capital. Cyber café and telecenter operators as well as their clients cite power outages as a major barrier to Internet access and use (Mwesige, 2004; Lugalambi, 2003).

FUTURE TRENDS

The Uganda Communications Commission, the independent regulator for the telecom sector, is currently spearheading efforts to improve universal access not only to the Internet but also to other basic ICT, especially telephones. In July 2001, the Commission adopted a Rural Communications Development Policy that aims "to support the development of communications infrastructure in rural Uganda and ensure that people in rural areas have reasonable and affordable access to communications services." Multilateral development agencies have also been instrumental in establishing and funding initiatives aimed at getting the Internet and ICT closer to low income and rural communities.

However, it is unlikely that the national digital divide will be overcome easily in a situation where 40% of the population still lives below the poverty line, and where 27% live below $1 a day. For such people, access to more basic needs such as food and clean water are more pressing. Yet, the promise of the Internet in smoothing economic and social development cannot be ignored.

CONCLUSION

Although the online population in Uganda is gradually growing, the Internet is not yet a medium of the masses. Factors including poverty and low purchasing power, the limited availability of the requisite hardware such as computers and telephones, as well as high connection costs have severely limited Internet penetration. Other structural problems such as deficient electricity supply and frequent power outages as well as social factors such as lack of knowledge and awareness of ICT are also major impediments to universal Internet access. Therefore, the typical Ugandan Internet user remains as a young educated male who not only has the disposable income but also the cognitive wherewithal required to be online.

Public access points such as cyber cafés and community telecentres have brought the Internet and ICT closer to more people in Uganda, contributing—however minimally—to closing the global digital divide. However, such access points, especially when they are commercially based, appear to be increasing the national digital divide.

The success of the combined efforts to increase universal access to the Internet and other ICT cannot be divorced from broader strategies to alleviate the poverty, economic underdevelopment and political instability that afflict Uganda and most of sub-Saharan Africa.

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KEY TERMS

Community Telecentre: A public place that provides low-cost community access to ICTs such as computers, printers, telephones, faxes, e-mail, and the Internet. In many cases telecentres also have library resources, as well as audio, video, and documentation production facilities. They may also provide training in the use of ICTs, distance learning, and telemedicine. They also usually support the production of information resources relevant to the needs of local users. They are sometimes referred to as Multipurpose Community Telecentres.

Cyber Elites: Sections of the population who have the disposable income, knowledge and language for exploiting the many possibilities presented by ICTs.

Digital Divide: The information gap between people with access to information and communication technologies and those with little or no access. The digital divide is sometimes referred to as "online inequality."

Internet Café: A public place that offers access to computers, e-mail and the Internet for a fee. In Uganda, as in many other parts of the world, cafes also offer other ICT-related services, such as printing and photocopying, as well as refreshments.

Public Access Point: Any public facility at which people can have access to the Internet, or even other ICTs. Internet cafés, community telecentres, phone kiosks, and public phone booths are typical examples in developing countries. In more industrialized countries, public libraries that offer Internet access also constitute public access points.

Social Access: The possession of the know-how required to utilize information and communication technologies optimally. Such know-how is mainly engendered by and related to education and training. It is not enough to have physical access to ICTs when large sections of potential users do not have the knowledge and awareness or cognitive wherewithal that would enable them to exploit the opportunities offered by these technologies.

Universal Access: The availability of information and communication technologies such as telephones, computers and the Internet to the widest range of potential users.

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Sustainability Issues for Australian Rural Teleservice Centres

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INTRODUCTION AND RESEARCH CONTEXT

The overall economic, social and environmental health of rural communities is one of the critical issues facing Australia. Without access to basic services, a small community can be left with a standard of living more like that of a third world country. Increasingly, services have an electronic component. Convergent digital services can lead to transformative effects, but can also exacerbate existing divides if technologies and the capacity to use them effectively are not available. Teleservice centres have in the past provided many forms of electronic services and training: computing, fax, printers, banking, etc. Today Internet functionality is a central aspect of rural teleservice centres, with broadband a looming issue. This article presents teleservice centres as a strategic national resource. Their potential to contribute to rural sustainability and equitable access to government services means that at every level of community and government, teleservice centres can delivery triple bottom line benefits.

This article is based on research (Geiselhart, 2004) by Community TeleServices Australia Inc (CTSA http://www.teleservices.net.au) for the Department of Communications, Information Technology and the Arts. In addition to reviewing related research, both Australian and international, the report drew on a set of working papers (http://www.teleservices.net.au/papers) prepared by a range of practitioners with wide experience in Australian teleservice centre operation and administration.

The impetus to examine the role of the teleservice centres came from the Regional Telecommunications Inquiry (RTI) Report. In it, Recommendation 5.5 of stated that "All tiers of government should work together to support teleservice centres in regional, rural and remote Australia, and to enable these important community facilities to remain viable."

The CTSA research identified success and failure factors consistent with related research on teleservice centres. International and other Australian perspectives confirm that it is necessary to consider the interactions between social, economic and environmental goals, and structure government service delivery to achieve synergies and generate transformative "network effects".

BACKGROUND

As of late-2004, the survival of many Australian telecentres hangs in the balance. Of more than 600 teleservice centres opened since the early l990s, more than a quarter have closed and many others teeter on extinction. While substantial progress has been made towards creating a minimal communication infrastructure in non-metro Australia, this task remains incomplete. An application layer is now needed to support local access and effective use of new technologies.

Regional Australia remains at a disadvantage in many ways. Not only are incomes lower on average than for metro Australia, but also the gap is increasing (ABS Regional Report). Thirty-six of the 40 poorest federal electorates are rural or provincial areas. This in itself makes it more likely that both instability and inequality will grow. Thus, non-metro Australia is less able to pay for the suite of skills and services of the online world, even if they are available. And often they are not, according to the RTI report. One commentator has observed a trend (initially seen in the U.S.) of rural towns becoming low-rent havens for a "new inter-generational underclass" (Firth, 2000). Although research has found that the demand for electronic services grows with the distance from an urban centre (Telecommunication Needs Assessment), market forces do not work well where long term trends indicate inequality is increasing.

Solving these problems is not a trivial task: half the area of the continent contains only 0.3% of the population, and the most densely populated 1% of the continent contains 84% of the population (Year Book Australia, 2002). The dynamics of globalization have seen many inland areas lose their livelihoods, as farms become larger and some small towns disappear or decline, with the

exception of accessible coastal areas (Budge, 1998). Given this situation, the importance of public access to telecommunications services, such as those offered by teleservice centres, is likely to persist indefinitely. The dynamic environment of teleservice centres today includes rapid technology change and changing demographics of regional and rural Australia. There is also heightened awareness of the need for greater responsiveness to catastrophe (cyclones, floods, infrastructure failure) and long term threats both perennial (flood, drought) and current (global climate change and terrorism). Communication technologies embedded in local skills, resources and people can be part of the response.

COMPARATIVE RESEARCH

Current thinking about equity in telecommunications access suggests that effective use of technologies at a local level is more important than provision of infrastructure that is isolated from social context (Gurstein, 2003). This common sense approach is backed up by evaluations and research on teleservice centres from many perspectives. Internationally, a Commonwealth of Learning report (2001) documented many instances of teleservice centre success around the world. Over and over, long term viability depended on finding and responding to community needs with an appropriate and effective level of technological provision.

Best and Maclay (2002) describe a number of interacting factors for the sustainability of rural Internet access. The main ones are costs, revenue, networks, business models, policy, and capacity. They say that in poor rural settings, this access must be seen as a public good, and be delivered as a community rather than a personal resource. It is important to harness network effects and offer appropriate business models. This is consistent with both effective use strategies and a triple bottom line approach.

Within Australia a similar picture has emerged. Due to space limitations, these cannot be discussed in detail. One comprehensive report is the evaluation of the Tasmanian Communities Online program (2003). This describes positive impacts on jobs, education, and general skill levels. Geiselhart (2002) illustrates some synergies that are facilitating the growth of rural digital book production. The same author researched several of the case studies in Australian Communities Online (NOIE, 2002), which also showed how technology can be harnessed for learning communities in holistic ways.

A particularly useful analysis is Goggin (2003). He looked at three representative but diverse small Australian rural areas. He found online services were steadily growing in importance, and there was a strong preference for involvement in relationship formation and mainte-

nance around communications, and for providers to be accountable or "owned" by the community. Emerging areas of demand include interactive broadband service and reliable high speed data service. He documented the importance of non-government, non-profit groups and the community sector in meeting local community telecommunication needs, and noted that "A dedicated arms-length body, with substantial funding, is likely to provide effective, efficient and practical coordination of local telecommunications initiatives."

The groups he studied were changing in their demographics. He described some of the emerging groups: the "sea change" customer, the "new lifestyle home business", the "technology intensive farmer", the "intentional community", and the "new cultural institution" of museum-art gallery-tourism. In the current context of declining inland rural incomes, his analysis raises the possibility of a rural low-rent welfare dependent rural group becoming the hired help for a new creative class. This would reinforce the need for teleservice centres where the public can manage their Centrelink payments, and participate in the upward techno-dynamic.

Goggin also looked another area of increasing interest to researchers and governments: the relationship between telecommunications and social capital. He found "Those communities able to best foster social relationships and institutions are also most likely to be able to organise and network themselves to get better access to telecommunications and online services." This indicates that some communities whose social capital is already depleted will benefit from cross-subsidisation of their public access centres to overcome the widening gaps between rural communities. He found that these access centres were important at a symbolic level also, as they demonstrate that the community is modernizing. He commented on the benefits of a community telco model, and its ability to enter strategic partnerships, as well as the importance of communities getting together to share costs and aggregate demand for bandwidth and other telecommunication services, and for building their "technical, social and economic capacity."

TELESERVICE CENTRE SUCCESS FACTORS

With the above research and much more as background, the CTSA research identified the following key factors for teleservice centre viability:

- Sufficient community commitment to having a centre
- Presence of a "social entrepreneur" or local leader who understands triple bottom line benefits

- Being in an easily accessible location, where out of town tourists or backpackers can stop in
- Sufficient funding horizons to allow a centre to mature and find its role
- Good mechanisms for governance and management, i.e., not being held to ransom by vested interests
- Providing services for and about local interests and culture, i.e., a community newspaper or video hire, information about activities, etc.
- Co-locating with other services valued by the community, such as banking, learning, neighbourhood centres, or other business and/or cultural activities
- Being able to respond to changing needs, whether this be staffing, business process, or technologies
- Being part of a cluster of other regional centres as partners expands options
- Having workable business models and being able to tell if they are working
- Providing a multipurpose environment with social and economic programs as well as IT
- Being able to form partnerships at multiple levels: local, regional, state/territory, and national
- Developing agreed upon guidelines for sustainability, including being able to be provide appropriate reporting and accountability to all stakeholders: the funding body, partners, and the community
- Being established as part of an existing network with an active Coordinated Support Unit provides a head start. Such centres are more able to enter into arrangements for delivering existing programs and services on a commission or fee for service basis.
- Having access to a State Support Unit also gives immediate access to a lobbying forum, new programs and services sourced on behalf of the network as a whole, quality control, training, cross fertilization of new ideas, marketing and collaborative learning to achieve best practice.
- Having face to face assistance from State Support Regional Coordinators
- Being able to make use of existing and available technologies, networks and resources

The full report for the CTSA elaborates on these factors and also discusses in more detail the suggestions for future development outlined below.

FUTURE DIRECTIONS

Teleservice centres are likely to turn towards triple bottom line approaches for sustainability. In today's increasingly complex world, managing change has become an industry and a catch cry for individuals, organizations and even governments swamped with information and unpredicted

events. Technology is part of both the problem and the solution. Residents of small towns in rural Australia do not need research to tell them that the closure of a bank puts them at risk. They know that their chances for getting by depend on the sum of environmental, business and social factors available to them. This is the essence of the triple bottom line. A full description of the triple bottom line in relation to teleservice centres is available in Crellin (2004).

The economic benefits of teleservice centres are perhaps easiest to document, as with the Tasmanian centres mentioned above. Businesses and individuals are helped to take part in the information economy, resulting in benefits for training, access to wider markets, skills development, procurement, research and statistics, and networking with others in similar businesses. Achieving critical mass of Internet access can create a local industry by itself.

A key social dimension of teleservice centres is the opportunity to become involved in digital communities and digital citizenship. The new literacies that underpin emerging forms of governance require learning and shaping (Griffiths, 2003). Teleservice centres offer non-metro Australians access to this learning curve. Without it, rural Australians may eventually become second class citizens.

A starting point for the environmental dimensions of teleservice centres is an appreciation that global environmental change is now a reality. The centres have already played a part in helping communities cope with environmental events, and their role is capable of expanding. Providing environmental information, assistance with preparation for cyclones and flooding, relief and recovery are some of the ways teleservice centres are involved with their communities and environment. Other services include environmental monitoring and electronic workshops for national systems management at the local level. The Victorian Landcare Gateway, developed in collaboration with teleservice centre Net-C, provides access to landcare information for the state, with localized information, contacts and discussion.

A government discussion paper (DCITA 2003) on teleservice centre viability identified local factors but overlooked the role of the other three levels that teleservice centres operate on and provide benefits for: regional, state/territory, and national. To this could also be added the importance of networking on an international scale, as issues to do with agriculture, trade, community building, business skills, education, health and the environment, just to name a few key areas, do not have national borders.

The CTSA research found that there is a need for government services to be coordinated and integrated at a local level. Without the support for infrastructure,

training and maintenance that large, long term clients such as government can provide, the viability of teleservice centres is uncertain. A local presence is also important if government services are to themselves be sustainable. This requires a plan for providing equal access to electronic services. An integrated centre that becomes a focal point for the three tiers of government is also valuable for the efficiency and cost-effectiveness of each contributing layer of government. Many teleservice centres are already co-located with Centrelink or Australia Post services. This helps bring people through the door, and helps centres to create community identity.

Future development undoubtedly lies with approaches that have already been proved. These include co-location with other services, including video shops, printing and laminating, cafes, digital photography, training of all kinds, but especially information technology, and other community based services. These often apply a small fee for service. Many other teleservice centre services can help a community work out what uses of new communication technologies and tools would be most effective for them. These services can be technology related: Internet, fax, email, videoconferencing and other online services and information, PCs, CDs, DVDs, web cameras, printers, scanners, digital cameras, other electronic equipment, word processing applications, spreadsheets and small business applications and tools, as well as the support and training needed to use them.

Teleservice centres can add value to cultural and craft industries, environmental, social, recreational, business, tourism and government activities and programs. Research assistance, particularly if co-located with a library, is another growing area. Technology in teleservice centres is the means to the end—not the end in itself. Nonetheless, broadband has become a key element for sustainability of teleservice centres. Slow connections are no longer capable of delivering equivalent access to rural citizens, students, health, legal and agricultural professionals, businesses and community organizations. Centres seeking contracts for government service delivery will increasingly have to demonstrate their capacity for doing this efficiently. The CTSA report suggested that multiple economic and social benefits could be achieved via a fast extranet that operates nationally and is therefore cost-effective.

The overall policy environment is also critical to the sustainability of teleservice centres. This encompasses the initial funding context, along with the settings and incentives that affect local media creation and intellectual property, tax structure and treatment of not for profit groups, and grant processes. In many cases, the correct policy mix may be achieved more easily through regional collaborations, as these have the potential to operate in a less highly contested political space.

Responsive adaptive governance processes are also needed at all levels to avoid "capture" by special interest groups. Transparency of process and agreement on measures of accountability are fundamental for capacity building at all levels. Part of the triple bottom line perspective is to "design in" processes that assist regional development in ways that are consistent with social sustainability. Transparent process in the management of teleservice centres can help to create democratic accountabilities at the other levels of interaction.

CONCLUSION

It would be a mistake to position teleservice centres as outposts of the extended welfare state. They are linked to creative expression but also to social innovation, and can be part of "democracy by design" through the cultivation of diversity, dialogue, and an informed citizenry. These are processes that are essential to government legitimacy, but also for adaptation to the changes that undoubtedly lie ahead.

The past twelve years can be thought of as Stage 1 of teleservice centres. Their value to rural communities has been firmly documented. There is now a need to shift from building to sustaining and maintaining. This requires investment in the application layer to achieve the promise of the information economy and equitable, sustainable objectives for government electronic service delivery. To attract non-government partners the teleservice centres need permanent anchor tenants. This can only be achieved by governments taking a multi-layered approach.

New communications and business technologies become a threat when small towns and isolated areas cannot access or make effective use of them. Rural people know that these technologies can and should be part of their solutions to local viability, if only they could be on the same technological playing field as metro Australia. In many parts of rural Australia, a multi-purpose teleservice centre is the only way to provide the business, government and social benefits of new technologies. It is also the only way to achieve network effects. This is partly because one person's online course becomes another's income, and one business web site becomes a model for 10 others.

At the very least, it is imperative that teleservice centres remain in place for the foreseeable future to provide a "beacon" in rural Australia. There can be considered a universal service obligation to provide citizens, consumers and business with an ability to participate in, benefit from and continue to learn about 21st century information and communication technologies. Anything less will lead to a two tier citizenry by exacerbating existing inequities.

In Australia there is not yet a cohesive or effective approach to regional and rural development, equitable national broadband infrastructure, or universal access to electronic government services. A comprehensive triple bottom line approach would be a first step towards overcoming these inadequacies to achieve multiple policy goals simultaneously.

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KEY TERMS

Capture: Capture refers in this context to groups that become compromised by their funding source at the expense of community responsiveness.

Community Development: Activities that consider social and economic benefits, including self-determination.

Digital Communities: Digital communities are cities, towns and communities that actively apply interactive communication technologies to enhance all aspects of their culture, community and commerce.

Effective Use: The use of communication technology that is fully adaptive and responsive to local needs and goals. Closely related to community development.

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Network Effects: The additional benefits generated when networks of any kind start to achieve positive feedback. The value of the network grows exponentially with the number of members.

Teleservice Centre: Electronic points of presence (often in rural areas) that provide a range of services, training and facilities. A hub for information and knowledge economy development.

Triple Bottom Line: Measures of growth or accounting that look at environmental, social and economic outcomes.

Sustainable Telecentres for Local Development

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INTRODUCTION

The telecentre movement is not at all old, having been born only in 1985 in Velmdalen, a small farming village in Sweden (Gomez et al., 1999). The concept is recognized and known by a large number of very different names: telecentre, telecottage, telekiosk, phone shop, telehaus, telestugen, cabinas publicas, multi-purpose access centre, multi-purpose community telecentre (MCT), community media centre (CMC), community learning centre (CLC), cybercafé, and so forth.

Telecentres were initially introduced with the purpose of fighting against the marginalisation of remote rural places, where the lower quality of Information and Communication Technology (ICT) facilities was seen to be an obstacle to participation in the information society. In the mid 1990s, telecentres experienced a rapid growth in Western European and other industrialized countries, to the point that by 1994 more than 230 telecentres had appeared in Australia, Austria, Canada, Denmark, Finland, Germany, Hungary, Ireland, Japan, Norway, Sweden, the UK and the U.S. (Latchem & Walzer, 2001). At present, telecentres are increasingly receiving considerable attention and support, both in developing and industrialized countries, from the international development community, a number of national governments, public telecom operators as well as private telecom service providers.

As it is clear from the foregoing, however, the form and functions of telecentres throughout the world still vary enormously in terms of size, facilities and services provided, and according to their rural or urban location. This is not only understandable, but in some ways also to be expected, since the telecentre phenomenon is still in discovery and its final form is constantly shaped by the very different contexts of implementation (Etta & Parvyn-Wamahiu, 2003).

As many authors agree, its adaptation and mutation is far from complete, and perhaps never will be (Colle & Roman, 2002; Whyte, 1999). As a result, attempts to classify the currently existing types are still relatively unsophisticated. Despite these important differences, however, common telecentre experiences and lessons are emerging from the field, highlighting critical issues and guiding the practical implementation of these projects.

For the purposes of this article, a telecentre is regarded as a centre that provides a broad range of services concerned with information and communication technologies, and which aims to promote educational, personal, social and economic development. Services provided typically include: access to the Internet, email, education and training, photocopying, fax, telephone facilities, and so forth. Furthermore, the approach adopted in this article rests on the assumption that telecentres are systemic entities, in which various interrelated social and technical elements play a relevant role (White, 1999).

Further assumptions, which generally underpin the so-called "telecentre movement", are made into the article. As evidence suggests, for example, it is reasonable to assume that relevant information, if provided through appropriate information and communication technologies, has the potential to contribute to development, and that carefully implemented telecentre projects are a viable way to link communities with ICT (Etta & Parvyn-Wamahiu, 2003; Fuchs, 1998; Latchem & Walzer, 2001).

This article is organized into four sections, and proceeds as follows. The next section is an introduction to the sustainability concept, aimed at providing a better understanding of the assumptions underlying the article. The third section provides an analysis of a wide range of telecentres' issues, outlining the author's opinion on the required conditions and pre-conditions to telecentre sustainability. The final section is a conclusion to the article, summarizing the major findings of the study and identifying potential areas for further research.

It is the hope of the author that this article will provide some answers to the many questions that are currently being asked, or those that will be asked in the future about this area of development action.

THE SUSTAINABLE DEVELOPMENT CONCEPT

Literature about telecentre activities is increasingly making reference to the concept of sustainability. The wider debate on ICT and development in general is laden with the need for sustainability, yet the concept is rarely examined closely nor is related to the specific development activity that is being discussed.

The concept of sustainable development was first introduced in 1987 by the World Commission on Environment and Development (WCED, 1987), known as the Bruntland Report:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development focuses on improving the quality of life for all of the Earth's citizens without increasing the use of natural resources beyond the capacity of the environment to supply them indefinitely.

Therefore, the sustainability discourse is not limited to the need for development to "pay for itself". Sustainable development is also concerned with the need for equity and fairness, and is characterized by a long-term view. Sustainable development is thus a much more complex goal to achieve, requiring the integration of conservation and development, satisfaction of basic human needs, provision and achievement of equity and social justice, and maintenance of ecological integrity (Gamble & Weil, 1997; Holmberg & Sandbrook, 1992).

However, while there is a general agreement around the world about the meaning of the concept, some authors have pointed out that sustainable development is likely to be specific to local conditions and possibilities (Parayil, 2000; Veron, 2001). For many years the Kerala Model of Development in India, for example, has met most of the above-mentioned criteria of sustainable development. Despite its poverty in terms of economic indicators, the state presents a set of very high social indicators of development that are outstanding if compared to the rest of India. This has led, therefore, to the idea that sustainable development, by its very nature, should be regarded as a global community-oriented concept rather than a nationally-oriented one (Veron, 2001). It must have local relevance, complement the specific values and capacity of the community or society in question, and be appropriate from a cultural, social, economic, technological and environmental perspective.

TELECENTRE SUSTAINABILITY: A MULTIDIMENSIONAL APPROACH

As argued in the previous section, the telecentre is a relatively new institution in developing countries and much still remains to be learned about its nature and role as a development tool. The development community is still uncertain with regard to the conditions that are required for telecentre success, and despite the intention to contribute to social and economic development, a relatively high failure rate of telecentre projects has been

experienced so far. A World Bank policy paper, describing an unsuccessful rural telecentre project in Mexico, comments: "Problems encountered included insufficient maintenance funding, inadequate political interest and will, and cultural constraints which hamper community interest in the projects" (Wade, 2002). Indeed, although interest in telecentres is now widespread, no comprehensive information exists, as yet, on what conditions are required in order to assure their sustainability and positive developmental impact.

To date, unfortunately, the debate about telecentre sustainability in developing countries has mostly focused on the financial aspect, and has often produced unsatisfactory results. It is only recently becoming more clear that, in order for telecentres to survive, sustainability has to be assessed taking into account its multiple dimensions (Mayanja, 2002; Stoll, 2003). Indeed, telecentre sustainability cannot be viewed on the basis of financial sustainability alone, particularly if the telecentre has as its aim not only the provision of ICT services but also community development.

This is not to say that financial sustainability is not important. Undeniably, although it is only one of several dimensions, it remains the most questioned and possibly the most problematic. Telecentre initiatives in developing countries have mostly been financed and supported by external donors, and often struggled to become financially independent. Private sector involvement has been rather limited so far, and usually restricted to donations and contributions. A number of experts and practitioners have stressed the importance of involving the private sector, assuming that if not operating as a commercial and profitable organization, telecentres will simply encourage incompetence and dependency, eventually leading to losses and failure (Best & Maclay, 2001; Proenza, 2001).

On the other hand, it has been argued that if telecentres have to serve and match the needs of communities, they should in some sense be considered as a "public good", worth supporting regardless of commercial viability, for the benefit of current and future generations. The evident weakness of this position, however, is that the conceptual validity of this argument does not necessarily ensure or lead to financial sustainability, nor to the achievement of positive developmental results.

As mentioned previously, a solution for telecentre sustainability is therefore likely to emerge only by thinking about the conditions needed for telecentres to be sustainable from different perspectives. Following this approach, additional factors have recently been associated with sustainability, including the operating environment, ownership and management styles of the telecentres, community participation and relevance of services and content (Etta & Parvyn-Wamahiu, 2003; Roman & Colle, 2002).

One of the next challenges is therefore adapting telecentres to local conditions and uses in developing countries, and allowing each country to understand these facilities and adjust them to their own development needs.

More specifically, the following issues are increasingly being pointed out in the literature as being important conditions and preconditions to telecentres' sustainability:

A. **Demand for Services and Content:** Economic viability of the telecentres certainly is an important question. An increasingly accepted idea, widely supported by empirical evidence, is that in order to generate income, telecentres should be demand-driven, and that this demand should be reflected in the community's willingness to pay for some of the services provided (Fuchs, 1998; Roman & Colle, 2002). Although this is a reasonable expectation, it is also directly linked to other complex issues (i.e., relevance, accessibility, etc.—see further text) and is, therefore, not easy to achieve.

B. **Relevant Information:** The need to provide relevant information and services to the communities should also be considered. At this time, much of the information available on the Internet, for example, does not meet local communities' needs. Therefore, appropriate content and services (where appropriate means relevant for the specific community) should systematically be developed in telecentre initiatives, preferably seeking local partners who can contribute to this process. At present, attempts create and/or repackage information that suits local requirements and environments are not extensive, although some efforts have been made, mainly in the African continent (see, for example: www.agricinfo.or.ug).

C. **Accessibility:** What is more, information may also lose relevance when it cannot be accessed. Availability of information is not commensurate with access, and does not in itself lead to use (Colle & Roman, 2002). Typically mentioned impediments to the use of information and services are language and technical illiteracy (Colle & Roman, 2002; Proenza, 2001). A survey conducted at Timbuktu Telecentre in Mali, for example, revealed that up to 51% of the community had never made a telephone call (Mayanja, 2002).

 C1. **Physical Accessibility:** Another aspect directly affecting access and use is the location of the telecentre, like schools and hospitals in colonial towns as opposed to traditional markets. Telecentres that are not carefully sited have been shown to draw fewer customers on account of physical inaccessibility (Etta & Parvyn-Wamahiu, 2003).

 C2. **Psychological Accessibility:** In addition to the location, the physical layout (i.e., plan), as well as the psychological accessibility of the telecentre, has been shown to influence access. Some users value privacy, for example, which is not always guaranteed in telecentres, and the power of psychological dimensions of use has been pointed out as being another reason of low accessibility (Proenza, 2001).

D. **Management and Social Arrangements:** Other important factors that affect the success of telecentres highlighted in the literature are operative at the micro and macro socio-political levels, and include such aspects as the national policy environment and the local social arrangements for the control and management of facilities (Etta & Parvyn-Wamahiu, 2003).

 D1. **Community Involvement:** At the telecentre level, for example, management and local community involvement appear to have some influence on telecentre outcomes and fortunes (Colle & Roman, 2002). Sound management and high level community support are prescribed for success, although community involvement may also be disruptive if and when community members active in the facility have different or hidden agendas.

 D2. **Community Ownership:** Similarly, community ownership is also believed to be related to success (Etta & Parvyn-Wamahiu, 2003). Empirical evidence clearly indicates that local communities should be genuinely involved in the management of facilities, and actively contribute to the running of the centres. Overall, a generally accepted indicator of a telecentre's success is actually the extent to which it becomes part of the community it serves (Fuchs, 1998; Mayanja, 2002; Roman & Colle, 2002). Therefore, according to this perspective, people in the communities should feel empowered by the center, and personally involved in meeting the challenge of sustainability.

E. **Technical Sustainability:** To sustain a telecentre from a technical point of view is another serious challenge, especially in rural areas where telecommunications and electricity are problematic and expensive, or when substantial maintenance is required. At Nakaseke and Nabweru Community Telecentres in Uganda, for example, some services couldn't start after the launch of facilities for several months due to the lack of adequate infrastructure, and then later problems were experienced in maintaining a stable state of services (Mayanja,

2002). It is fairly obvious that, beyond hurting the reputation of the telecentre itself, interrupted services have a negative impact on the revenue stream. This suggests the need to carefully choose inexpensive and easily maintainable infrastructure and equipment in order to ensure their sustainability. Moreover, as several authors suggest (Colle & Roman, 2002; Etta & Parvyn-Wamahiu, 2003) telecentres should have at least basic capacity for troubleshooting, in order not to rely on external support should minor technical problems occur.

F. **Networking:** More recently, experts and practitioners have also started to stress the importance of networking between telecentres, as a crucial requirement for sustainability (Stoll, 2003). This organization is suggested for several reasons. First, it increases telecentres' effectiveness and chances of success by allowing them to share insight and experience. Second, it allows them to share and more easily access resources. Third, these networks can actively engage in public policy debates, with increased efficiency and contractual power. Being part of local, national or international networks, for example, could allow telecentres to achieve connectivity at lower costs through block deals between telecentre networks and the public sector (Stoll, 2003). Finally, a network of telecentres under a single "management", name or branding, might also carry the advantage of increased recognition.

G. **Political Sustainability:** Political sustainability refers to "the importance of securing a regulatory framework that will protect, promote, and support community telecentres and their activities, with special attention to the specific needs of the poorest sectors" (Stoll, 2003). More specifically, in order to sustain telecentre activities, the communications regulatory environment should be conducive to investments and promote the principle of third-party provision of communication and information (Best & Maclay, 2001; Colle & Roman, 2002). In some African countries such as Ethiopia, for example, telephone connectivity and Internet services can only be provided by a small number of licensed telecommunication operators. Moreover, most developing countries lack favorable tariff policies that could encourage the development of public access services. Telecentre operators usually have to pay standard retail tariffs for services, and thus have little room for generating margins to ensure sustainability (Best & Maclay, 2001). There are, however, some interesting exceptions. In Uganda, for example, the telecom regulator recently decided to allow public phone providers to receive some of the income

from incoming calls (Mayanja, 2002). Finally, besides the creation of favorable conditions for the development of public access services, constructive national policies could be instrumental in producing the human resources needed to support sustainability. The Indian government, for example, in the last few years has doubled the number of students graduating from its universities and technology training institutes (Colle & Roman, 2002).

CONCLUSION

This article is an attempt to establish what has been learned since the launch of the first pilot telecentre projects, and to identify weaknesses and improvements needed in order to achieve better results with the development of future initiatives. The principal issues of concern for the study were related to sustainability and the consequent potential social and economic impact on the communities within which telecentres are situated.

The arguments supported so far suggest that no single model or approach to providing community services will succeed in every context. Different countries and different kinds of communities are likely to require different types of telecentres and/or different telecentre "models". In line with this vision, the article has suggested widening the concept of sustainability in such a way that includes, besides financial sustainability, social, political, cultural, and technical sustainability as elements of equal value. More specifically, the arguments supported in the article suggest that sustainability is possible, provided that some crucial conditions and preconditions are satisfied.

The final conclusion from this article relates to the need for further research. Indeed there is, in general, a lack of research on how the cultural, economical, socio-political and technological characteristics of developing countries influence the evolution of telecentres. Since telecentres are likely to be a topic for research and development for several decades ahead, some research issues are indeed urgently needed.

It would be interesting to explore, for instance, the socio-political environment in which the telecentres are usually operating. An analysis of the linkages and dynamics between the project donors, the project implementers and local communities—often known to be complex and fuzzy—might provide very interesting insights.

Search for parameters, indicators and tools to assess the impact of ICT for development in general, have a long way to go too. Similarly, since it does sometimes appear that telecentres are not always leading development action, there is also a urgent requirement for a robust theory

that explains the relationship between telecentres (and ICT) and development at the micro and macro-level.

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ENDNOTE

[1]   The views expressed in this article are those of the author, and should not be attributed to the E-Government for Development Technical Unit, Government of Italy.

Technology Leapfrogging in Thailand

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TECHNOLOGY LEAPFROGGING

The phrase "leapfrogging development" reflects the belief, especially in the 1980's, among policymakers and theoreticians that information technologies, especially telecommunications, can help developing countries accelerate their pace of development or telescope the stages of growth (Singh, 1999).[1]

The telecommunications literature uses the word "leapfrogging" in three ways:

- First, it is meant to imply that telecommunications can help developing countries skip over the stages of development and become members of a post-industrial society.
- Second, leapfrogging is used in "an engine of growth" sense to mean that telecommunications can help developing countries accelerate their pace of development[2].
- Finally, leapfrogging is used in a technical sense to signify skipping over the technological frontier or product cycle[3].

Often the word leapfrogging is used interchangeably referring to both technical and economic "leaps"[4] (Singh, 1999), usually though the two are interdependent. The term "Technology Leapfrogging" is also being used to describe the phenomenon that is being seriously and widely considered in the developing world with countries such as Egypt, Malaysia, Thailand, Canada and Bangladesh having gone or going through the experience at the moment (Davison, Vogel, Harris & Jones, 2000).

PROMISE OF ICT-DRIVEN GROWTH

The possibility of developing countries leapfrogging has come about through the progressively lower cost of technologies and the user friendliness that is allowing the development and implementation of systems that would otherwise be unavailable to them (Weiss, 1994). Further, "economic and social progress has forged in South East Asia (SEA) a perception of growth previously unparalleled in human history" (Lander, 2000). There is an inevitability in SEA that ICT-driven economic expansion will simply occur because of the size of the population, "which is young, well-educated and with rising incomes" (Lander, 2000). It can be further suggested that the expanding market and the use of high-tech devices are interpreted as cultural systems that are used in the construction of modernity and that the economic and social focus of the South East Asian nations is on market corporatism, market socialism and high tech developmentalism" (Boyd, 2002). Asian Tiger countries have been pursuing a number of projects that use Technology Leapfrogging to surge forward in this development and economic race, to rescind the ever-growing gap between the developed and developing countries (Gray & Sanzogni, 2004).

Availability of funds in the South Asian region has attracted $4.196 billion (2.5% of total FDI) (Saidi & Yared, 2002). However, it is unclear how many countries fully appreciate the need for a coordinated effort across all sectors in terms of the implementation of an ICT-based commerce strategy. Such an implementation represents a considerable challenge requiring integration of technology, law, policy, business processes and skilled people (Keretho & Limstit, 2002). But that's not all. A major problem facing developing nations is the lack of a sound telecommunication infrastructure which forms part of the basic building block for a modern ICT-based socio-economic infrastructure (Davison et al., 2000).

The close relationship of communication networks and development is one of the reasons that investment in communications has become a priority for so many governments. Only 5% of the population in developing countries has access to the Internet. With the measure of telecommunication access expressed as teledensity, we note that 50/100 people have telephones in the developed world against 1.4/100 in developing world (Tipton, 2002). In Asia the lag in provision of a basic telephone service was starkly illustrated by a report estimating only 10% of the 500 million telephones in the world were in Asia in 1991 (Asia Money, 1991;

Larson, 1995). ICT has good potential to create (via communication) social and economic networks leading to advances in development. However, lack of ICT implementation not only runs the risk of an economic divide, but also a political divide with people being potentially cut off from participation in future economic activities beyond regional boundaries.

Further clouding the issue, there is no clear evidence, according to economists, to support the belief that ICT can create growth. There is also indication (Tipton, 2002) that difficulties in measuring success in ICT solutions increase when moving from the private to the public sector as there is lack of a framework of analysis (ultimately the P&L). Other difficulties cited are of a cultural nature, such as the resistance to systems leading to greater transparency and accountability, as in developing countries there are cultures of subservience, gifts in exchange of favours, etc.

NATIONAL FRAMEWORKS FOR "TECHNOLOGY LEAPFROGGING" DRIVEN DEVELOPMENT

Ultimately however, governments recognise the need to enhance physical and knowledge infrastructures to improve competitiveness. ICT solutions are seen as a strong central to enabler of these initiatives and successes in some countries in the region give an optimistic outlook to leapfrogging implementations. Chalmers Johnson's study of Japan and later Weiss', Evans', and Wade's studies of South Korea, Taiwan and Singapore, all identified models of governments intervention for the fast-paced introduction of ICT (Tipton, 2002). These studies contributed to the identification of "pilot agencies" whose successful drive of ICT implementation stood out as good examples to follow. The respective agencies are Japan's Ministry of International Trade and Industry (MITI), South Korea's Economic Planning Board (EPB), Taiwan's Council for Economic Planning and Development (CEPAD), and Singapore's Economic Planning Board (EPB). Tipton (2002) attributes the ICT implementation successes of these nations to:

institutionalised position and organisational structure. They are elite institutions, attracting high-quality staff, possessing a high degree of cohesiveness and strong sense of commitment to national goals. They are not large bodies, but have adequate staff and independent funding that provides sufficient resources to achieve their mission. They possess powerful capabilities for assembling and analysing data, giving them insight into both current conditions

and possible future directions of development. They are 'insulated' from direct contact with industry groups, but they are not 'insular' or isolated from the concerns of their constituents. This can be achieved organisationally by a combination of 'horizontal' departments responsible for overall policy and 'vertical' departments concerned with particular industries, but it depends to a large degree on the acknowledged expertise of the officials and their resulting prestige in dealing with industry groups. They are also insulated from short-term political concerns. They do not depend on politicians for their positions, and they must be able to resist pressure from politicians whose interest may clash with long-term approaches to economic policy.

Pilot agencies traditionally have performed two tasks:

- The provision of advice on policy development.
- Administrative responsibilities for the deployment of funds into specific industries for the introduction of new technologies whose benefits are judged to have the greatest probability of a beneficial spill-over effect into the economy as a whole.

It is important to note that while these agencies played and play a significant role in terms of policy development and technology implementation at the national level some, as in the case of Singapore's EPB, also helped in paving the way for foreign investment and the positioning of local offices of foreign firms with special emphasis on high tech.

We now turn our attention to two particular economies, namely South Korea and Thailand and draw comparisons in terms of leapfrogging success. Both these countries have emerging economies and plans to become leaders in the region by investing heavily in ICT. However we note that one economy is still essentially in reactive mode responding to issues and circumstances as they arise, while the other has adopted strategically-based proactive initiatives in order to promote and retain business investment. Mashelkar (2003) in his address to the Royal Socitey (10th Zuckerman Lecture) clearly elucidates the difficulties and promises that the introduction of a dynamic economic environment (such as in Singapore) can bring to developing nations.

South Korea

South Korea's successful initiatives leading to the transformation of its communications industries and environment are a great example of technology leapfrogging, which included infrastructure development, tech-

nological progress, growth of its electronics industries, regulatory changes and changes in media culture and habits of the Korean people (Larson, 1995). Larson's (1995) study expounds the processes that South Korea utilised to advance to an information society, indicating teledensity increased faster than any comparable country in the world from 1978 to 1990. This rapid telecommunications network development during the 1980's attracted a great deal of attention because it occurred in a developing country. Accordingly many policy makers and industry experts believe that a modern telephone network is a prerequisite for development (Larson, 1995).

Korea's high level of literacy and high participation in education is seen as a prerequisite for the success rate enjoyed by ITC-based technologies. So much so in fact that today its knowledge and information industry plays a significant role in the nation's economy. Other significant factors in Korea's Internet access growth point to:

- The explicit introduction of Korean content on the Internet (a policy also adopted by Thailand).
- The release of broadband Internet access to facilitate streaming, gaming and e-commerce.
- Fibre-optic backbones across the country.
- Sound international connectivity that stood at 5.2 Gbps as of December 2001.
- The lowest broadband access prices in the world.
- Mobile/Internet numbering integration to facilitate mobile Internet.

Korea is now ready to move from e-readiness to e-nation since implementing a number of e-government projects. In 200 all government agencies and ministerial offices were connected to the Internet via high-speed backbone. About 80% of official documents are in digital form with a 60% rate of document handling over the Internet. Property titles and owner registration is now handled online, as are births, deaths, marriages and divorces with citizens able to access and alter records online.

Korea's ICT success factors are:

- A National Project Evaluation to allow the government to put achievements into an international perspective, and also the comparison of different government strategies.
- An evaluation system for national IT projects composed of government officials as well as academics and experts from research organisations and industry.
- Research and development in the field of electronics and telecommunication, policy and vision for a knowledge-based society.

- Universal access as a direct challenge to the digital divide with goals to furnish every region in the country with broadband access.
- The distribution and supply of PCs with Internet access to children of low-income families and the availability of Internet access in public places.
- Right environment for ICT implementation and operation with the support of just legislation in the form of cyber laws and a secure operating environment.
- Learning from and sharing with others through a liberal dissemination of reciprocal experiences through conferences, workshops, forums, etc.

From the evidence, Korea's approach to ICT's successful implementation as a technology leapfrog should be seen in terms of a national enabler across all significant sectors and thus (in Korea's case at least) the ICT leapfrog appears to have achieved the status of a leapfrogging technology.

Thailand

In the case of Thailand Information Communication Technology (ICT) developments are divided into two diverse yet related areas (Technology and Telecommunications, respectively), which are fundamental for progressing Thailand into a post-industrial nation. Those technologies more specifically relate to the development of telecommunication and Internet infrastructures within the nation (Gray & Sanzogni, 2004). The National Information Technology Committee (NITC) oversees Thailand's ICT initiatives at the national level through a number of sub-committees.

Historically, in the early-1980s there were two state enterprises managing Thailand's telecommunications, the Telephone Organization of Thailand (TOT) and the Communications Authority of Thailand (CAT), providing a limited service of two telephones per 100 people (Corey, 1995; Weiss, 1994). The Asian Technology Information Program (ATIP) on IT&T in South East Asia conference 1995, reported that "Thailand has critical telecommunications infrastructure needs," indicating Thailand's national plan to add 8 million telecommunications lines by 2001 with a further goal to increase the lines per 100 people from two to 20 early in the new century. They estimated the growth demand at 600,000 lines per year (Corey, 1995). TOT estimated in 1996 that demand would rise to 800,000 (Palasri, Huter & Wenzel, 1999). Projected estimates for telecommunications installations were high in 1999, although this positive progression would have been significantly effected by the economic

crash in 1997. These targets have not been met, according to the National Statistical Office of Thailand, which reports in the Thailand Development Indicators Report of 2003 (Ministry of Information and Communication Technology, 2003) that only 9.6 people per 100 people in the population had telephones, with a ratio of only 3.89 per 100 people having mobile phones. These figures are no longer being distorted, as they are now being reported as separate telecommunications devises. Additionally another high-profile project, the SchoolNet project, seems to have stalled from an initial indication of 5,000 schools having Internet access by the year 2001 to only 4,794 reported as being online as of October 2004, after which there has been no further reporting (Ministry of Transport and Communications, 2001).

In 2000 Thailand's cabinet directed the National IT Committee to study e-ASEAN, a framework established in November 2000 by ASEAN (Association of South East Asian Nations) to facilitate the set up for an information-sharing medium, with a view to make recommendations with particular emphasis on e-services, e-government, and e-trade (http://www.aseansec.org/11499.htm). Thailand is pushing strongly for an e-Thailand identity as a forerunner to full participation in the global electronic marketplace. The formulation of Thailand's IT draft policy "IT 2010 (2001-2010)" signals Thailand's intention to move toward a knowledge economy. Within the course of the decade Thailand intends to move from a position of "Dynamic adopter" to "Potential Leader" with fully embraced and mature ICT-based technologies (Tipton, 2002).

To date, it appears that although Thailand had established an aggressive commitment to reform in the 1980's under the guidance of the then Prime Minister Prem Tinsulanonda, lack of recent coherent policy leadership since Prem Tinsulanonda left office in 1988 seems to have left a void where a comprehensive national IT policy is required (Corey, 1998) to aggressively utilise technology leapfrogging and make the significant funds available to develop the telecommunications network throughout Thailand in order to avoid a looming expansion of the digital divide. There is evidence that population reach is not good and far from uniform. Telephone lines per capita are still low, e-government initiatives are lagging behind and the education systems is still struggling to get online or produce graduates to drive the economy. There is an ongoing need to promote e-commerce as a trading tool, which can be taken as a sign that its not been taken up (seemingly due to lack of adequate supporting technical infrastructure, although negotiations are occurring in terms of further broadband development) (World IT Report, 2003). The harmonisation of cyber laws across trading partners is still in its infancy and, although on the National's IT committee agenda, quick progress is not expected in terms of an implementation across ASEAN trading partners (Bernama, 2003).

CONCLUSION

In concise terms (given the discussion thus far), the measure of success for an ICT leapfrog should be its pervasiveness throughout the nation's population, with clear, uniform support across its ethnic, social, cultural, economic, religious and political groups, men and women, the rich and poor, and the young and the old. ICT should thus be seen as an enabler of a national and eventually global epistemology model that is emergent, liberating, pluralistic and participatory on the world stage. With this mindset a nation can reap the full benefits of an ICT leapfrog, as ultimately it will have created a firm opportunity for the populous to inform and be informed at will.

Although Thailand is pursuing initiatives that have good potential as both technological (ICT) and economic (e-business, e-government, e-education and e-commerce to name some) drivers, the impetus seems to have stalled somewhat. The culprits seem to be inadequate funding, key committees under political jurisdiction, and a shortage of local experts and professionals (outside the political system) to drive the leapfrog (Tipton, 2002; World IT Report, 2003; ITU, 2003).

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KEY TERMS

ASEAN: Association of Southeast Asian Countries.

ATIP: Asian Technology Information Program.

CAT: Communications Authority of Thailand.

E-ASEAN: A concept capturing the essence of the intent to establish electronic links at all levels between ASEAN countries.

E-Business: A concept capturing the essence of conducting business by electronic means in addition to or as a substitute for a physical location (bricks and mortar). E-business (electronic business) is, in its simplest form, the conduct of business on the Internet. It is a more generic term than e-commerce because it refers to not only buying and selling but also servicing customers and collaborating with business partners.

E-Commerce: A concept capturing the essence of carrying out commerce by electronic means. E-commerce (electronic commerce) refers to the buying and selling of goods and services on the Internet, especially the World Wide Web. In practice, this term and a newer term, e-business, are often used interchangeably.

E-Education: A concept capturing the essence of carrying out education by electronic means.

E-Government: A concept capturing the essence of carrying out the business of government by electronic means including the delivery of public services, and voting (in some instances).

P&L: Profit and Loss statement.

SEA: South East Asia.

TOT: Telephone Organization of Thailand.

ENDNOTES

[1] Stages of growth argument go back to Rowstow (1960), who postulated that economies go through specific stages from the feudal to the industrial age with a short "take-off" stage lasting two to three decades propelling developing societies into industrialization. For its use in the leapfrogging sense (see Karunarante, 1982, p. 212, Singh, 1999) *Leapfrogging Development: The Political Economy of Telecommunications Restructuring* (1st ed.). Albany, NY: State University of New York Press.

[2] The idea of accelerating the pace of development through newer technologies and state-led mecha-nisms goes back to Gerschenkron (1962). For its application in telecommunication literature (see Bruce, 1989, p. 45). Singh, J. P. (1999). Leapfrog-ging Development?: *The political economy of telecommunications restructuring* (1st ed.). Albany, NY: State University of New York Press.

[3] See Nutly (1989 p. 10); Fredebeul-Krein and Freytag (1997 p. 478). Singh, J. P. (1999). Leap-frogging development? *The political economy of telecommunications restructuring* (1st ed.). Albany: State University of New York Press.

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Telecentres in Low-Income Nations

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INTRODUCTION

Dial-up Internet access, wireless mobile services, cybercafés, etc., are fundamentally changing the nature of communications and knowledge and information access for millions around the globe. However, many remote, rural, and disadvantaged urban communities in low-income nations still lack access to the very ICT tools that can help to improve their lives. Many governments lack the commitment or capacity to provide the infrastructure, and many communities lack the resources or technical expertise to use the technology. For example, excluding the more developed regions of South Africa and northern Africa, only one in 250 Africans can access the Internet, compared to one out of every two persons in North America and Europe. Similar digital divides plague the Asia-Pacific region and Latin America (NUA, 2004).

Telecentres can provide a way of providing ICT-enabled education, training, information, and e-commerce in these regions, empowering and supporting community self-development.

TELECENTRES: SOME GLOBAL EXPERIENCES

Telecentres (also known as telecottages, information kiosks, infocenters, cabinas públicas, espaces numérisés, telestugen, etc.) are one-stop shops providing satellite or local ISP Internet connection, free or heavily discounted telephone, fax, e-mail, and Internet services, ICT training and support, education, news, information, e-commerce and telework opportunities, etc. Some are stand-alone, while others are networked. They are variously accommodated in community centers, shops, marketplaces, and other settings where people naturally congregate.

The telecentres movement started in Scandinavia in the mid-1980s. It then spread to Western Europe, Australia (Short, 2001; Gooley, 2001), North America (Sheppard, 2001; Hartig, 2001), the former Eastern Bloc countries (Murray, 2001), and finally, low-income nations.

Some low-income nation community telecentres have been established with funding and support from international agencies such as UNESCO and International Telecommunications Union (ITU); some through the Microsoft Unlimited Potential initiative (Microsoft, 2004); some through national development agencies such as USAID, DANIDA, and Canada's International Research and Development Center (IDRC) working in partnership with local stakeholders; and some by local institutions, nongovernmental organizations (NGOs), entrepreneurs, and public–private partnerships.

Latin America and the Caribbean

Latin American governments are interested in the power of the Internet and telecentres to promote socioeconomic development and democracy. The Venezuelan government has established 243 infocenters providing free Web access in libraries, museums, town halls, and NGO offices, and plans to open many more. In Brazil's largest city, San Paolo, 100 infocenters allow people to surf the Internet free. In Chile, 294 telecentres offer discounted rates for isolated rural communities and poor urban neighborhoods.

In Paraguay, the Municipality of Asunción and USAID have collaboratively established "Aulas Munipales de Información, Communicación y Aprendizaje" or AMIC@s in municipal centers, schools, a cultural center, a bus station, a market, and a public park in poor neighborhoods. These AMIC@s are run by volunteers who are familiar with the local communities, and they enable disadvantaged adults and children to be trained in ICT, browse the Web, e-mail, chat, videoconference, seek employment, learn about government and community services, design their own Web sites, etc. (Aranda & Fontaine, 2001).

The Mexican government's e-Mexico initiative (http://www.e-mexico.gov.mx) includes the establishment of 20,000 "Centros Comunitarios Digitales" or "community plazas" for disadvantaged rural communities. Equipped with computers, Internet connection, satellite television, and, in some cases, videoconferencing facilities, these centers are designed to increase access to education, health, and other public services. The National Institute for Adult Education is piloting distance-education programs for the educationally disadvantaged through a mix of face-to-face instruction by plaza coordinators, educational television, Web conferencing, and e-mail. The first of these programs was "¡Aguas con las adicciones!" ("Beware of addictions!").

Other Latin American initiatives include the INFOCENTROS project in El Salvador (http://www.infocentros.org.sv), the www.telecentro.cl in Chile and the 1600 Centros Tecnologicos Comunitarias in Argentina (http://www.tele-centros.org).

The Barbados Government, conscious of the importance of ICT in learning, business, and recreation, has launched a Community Technology Program within which 30 of the island's community centers and sports pavilions have been converted into ICT resource centers providing free access and training. Equipped with Internet-connected workstations, printers, scanners, and other peripherals, these centers have been designed to serve those on low incomes with limited educational opportunities and encourage small local enterprises to use ICT.

Further accounts of telecentres in Latin America and the Caribbean appear in Márquez (2004), Hunt (2001), and Delgadillo and Borja (1999).

Asia

India, with a telephone penetration level of less than 4%, has a great need for increased ICT access. Telecentres can be invaluable in those rural areas where 70% of the subcontinent's billion people live, providing access to computers and the Internet, agricultural and market information, e-commerce opportunities, and educational and vocational programs (Panda & Chaudhary, 2001).

Warana Wired Village (http://www.uncrd.or.jp; http://www.sustainableicts.org) is designed to accelerate socioeconomic development in 70 villages in Maharastra State. Kiosks have been set up with dial-up capability and uninterrupted power supply (UPS) backups or high-speed, receive-only VSATs (very small aperture terminals) to provide free access to educational and agricultural information in the local language, Marathi. The centers' part-time managers are appointed by the village councils or *panchayats*. A central hub at the Institute of Engineering Technology facilitates all applications. The project has received strong political support, but slow Internet connections, low levels of literacy, and limited community awareness of the possibilities prevent these centers from being fully exploited.

The National Institute of Agricultural Extension Management (MANAGE) in Hyderabad, Andhra Pradesh (http://www.manage.gov.in) has piloted information kiosks in village cooperatives and council offices. Each kiosk serves 25 to 30 villages (up to 30,000 people) and provides training in ICT, especially for women and children, farming and agribusiness information, and e-learning on childcare, health care, and other useful topics. These centers are currently hindered by poor Internet connections and the limited number of Web sites in the local language (DFID, 2003).

Gyandoot ("purveyor of knowledge"; http://gyandoot.nic.in) is a Madhya Pradesh Government intranet system connecting over 80 rural cyber kiosks throughout Dhar District. These kiosks again serve 25 to 30 villages and are based in local schools or run by local entrepreneurs in *panchayat* buildings, marketplaces, and bus standpoints on major roads. Full Internet access is being progressively rolled out using wireless in local loop (WLL).

The Bangladesh Grameen Communication Village Computer and Internet Program, run by NGO Grameen Bank (http://asp.grameen.com/dialogue/dialogue54/specialfeature.html), has established two village telecentres, each equipped with eight computers and providing low-cost Web access and training in computing, word-processing, graphic design, etc. Due to the high cost and unreliability of the dial-up connections, the centers use a wireless link to connect to the Internet via Grameen's headquarters in Dhaka. To encourage local businesses and groups to go online, the centers also act as low-cost Internet service providers (ISPs). The centers are popular, helping to overcome problems of access and literacy, and being economical for the users. However, the local resources are insufficient to sustain these centers, and Grameen Bank has concerns about their long-term viability.

More information on other telecentres in India, Malaysia, Philippines, and Mongolia can be found on the Web at: http://www.unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN006304.pdf and http://www.is.cityu.edu.hk/research/ejisdc/vol4/v4r3.pdf.

Sub-Saharan Africa

Telecentres in sub-Saharan Africa are feasible only with external support (Benjamin, 2001). A number of telecentre initiatives in Mozambique, Senegal, South Africa, Uganda, Mali, Benin, and Tanzania have been established under Acacia, an IDRC international research and development program designed to support the African Information Society Initiative (AISI; http://www.bellanet.org) and empower communities to apply ICT to their own social and economic development (web.idrc.ca/acacia). Some of these IDRC/Acacia telecentres have been co-funded by UNESCO and ITU.

Mayanja (2001) provides a case history of a UNESCO/IDRC/ITU-supported Ugandan telecentre, and Gaster (2001) describes two IDRC/UNESCO telecentres in Mozambique.

Support for telecentres in South Africa has largely been through the Universal Service Agency (USA), which provides access to ICT services denied to the black majority during the years of apartheid. USA-supported telecentres have been established where communities

and small business have been able to demonstrate their support for such centers and a capacity to assist women and other disadvantaged groups. Benjamin (2001) provides a case study of a USA-supported center in Northern Province.

The Soweto Digital Village telecentres in South Africa are a public–private initiative sponsored by Microsoft and other companies. They are designed to give communities, schools and local entrepreneurs opportunities to develop computer skills and take advantage of ICT, to support small business and community and cultural events, and to provide access to online courses from around the globe. Some of these centers have fallen victim to robbery and financial failure, but Soweto Digital Village is now registered as an organization under the Company's Act, which allows the centers to apply for accreditation, state subsidies, contracts, etc. (DFID, 2003).

Other reports on telecentres in sub-Saharan Africa may be found in Etta and Parvyn-Wamahui (2004), and at http://www.communitysa.org.za/africaict/telemodel.htm and http://www.wanadoo.fr/christian.carrier/Africa.htm.

TECHNOLOGIES

Telecentres provide public telephone access by means of modem/dial-up connection, leased lines or cellular, and satellite or wireless links and then piggyback other value-adding services onto this, including e-mail, Internet/Web access, discussion groups, chat rooms, fax, audioconferencing, and videoconferencing. Some telecentres manage with only one telephone line. However, at the time of publication, single lines cannot simultaneously carry voice and Internet traffic, and there are often multiple users, so it is more usual for telecentres to have multiple connections.

The choice of the other technologies depends on the users' information, educational, communication, work needs and capabilities, the funding available for the capital and recurrent costs, the potential for income generation, and such issues as compatibility, the availability of maintenance and repair services, and security. Computers, scanners, printers, etc., are needed for ICT training, desktop publishing, Internet- and Web-based learning, etc., and the computers need modems and links to, and accounts with, ISPs offering Web-hosting services. Cable or wireless LANs (local area networks) may be needed to link computers or buildings. The centers may also need facilities for photocopying, binding and laminating, paper shredding, showing films, TV, and videos, and enabling communities to record their own programs and resources using digital cameras. UPS and backup facilities such as generators, batteries, and invertors are needed in areas where the power supply is unreliable.

Information access and dissemination may be further enhanced by using video and low-cost, portable FM transmitting stations and digital radio systems that transmit by satellite or terrestrial cellular networks and can be received by wind-up, car battery- or solar-powered radios.

DISTANCE LEARNING

All telecentres have a training role in ICT. Many also foster lifelong learning by developing links with universities, colleges, and other educational and training providers, sourcing and providing distance education programs, enrolling students in accredited programs, providing rooms and resources for self-study, and acting as online training centers for, e.g., nurses and local government officers.

For telecentres to have a central educational role, it is important to develop a wide community awareness and interest in the educational possibilities and provide locally relevant programs for those who are poorly educated, semiliterate, and non-English speaking.

TELEWORK

Telecentres can also provide opportunities for local employment, self-employment, and income generation. Users trained in ICT can engage in "telework," working for employers or customers at a distance by means of e-mail, fax, or phone. This work can be flexible, part-time, or job-shared, and can take the form of, e.g., information services, word processing, desktop publishing, bookkeeping, accounting, translating, writing, editing, publishing, multimedia production, Web design, and computer programming.

Telecentres can also help to create work opportunities and generate income by marketing and selling local produce and arts and crafts over the Internet, conducting fieldwork and surveys for external clients, and acting as childcare centers, post offices, banks, call centers, booking offices, tourist offices, community newspaper publishers, etc.

ENSURING SUSTAINABILITY

Telecentres have met with mixed fortunes. Some have succeeded. Others have failed because of poor connections and power supply, high usage costs, lack of community support or failure to build a critical mass of users, poorly trained managers and staff, or an inability to

generate sufficient revenue after donor support has ended.

Before establishing telecentres, research is needed to determine the needs of the potential users, their perceptions of the benefits of the Internet, and what might induce them to use these centers. It is also essential to gauge the possible support and partnership opportunities with public, community, and private agencies. The strategic and operational directions of the telecentres then need to be tailored to local needs and traditions. The centres need to be proactive as well as reactive in helping the communities to realize the potential of the Internet. They also need to be backed by sound business plans and actionable implementation frameworks to ensure their long-term sustainability.

There are various models of ownership, management, and funding of telecentres. In Western Australia, the telecentre network's technology, infrastructure, and overall management are provided by the state government, while the centers' accommodation, management, operations and income are the responsibility of local management committees acting in accord with contractual agreements with the state body. Under the South African USA scheme, telecentres may be held in trust until the community owners are in a financial position to assume full responsibility for their operations. In the Bangladesh, Grameen Village Phone program, the not-for-profit Grameen Bank (http://www.grameen-info.org) offers small collateral-free loans to villagers to become cell phone operators, and these loans can then be repaid through the income generated through their kiosks. N-logue (www.n-logue.com) in India is a franchise-based business model developed by the Telecommunications and Networking (TeNeT) Group of IIT, Madras. It brings ICT services to rural areas using WLL, a network of centers providing up to 500 connections and Web-based services over a 25 kilometer radius (2,000 square kilometers) and village kiosks run by local entrepreneurs. The telecentre at Maseru, Lesotho, was sponsored by a private company, DaimlerChrysler (Howard, 2001). Other telecentres operate on a purely for-profit basis.

FUTURE DIRECTIONS

There are still many regions and communities that can benefit from telecentre support networks. But ICT access alone will not propel these forward. Users, funders, and policy makers need to be helped to recognize how the technology can be used for capacity-building and development in local situations.

The vital role that ICT can play in overcoming low educational achievement, cultural misunderstanding, injustice, and inequity is not necessarily fully understood by all governments or local communities. So it needs to be shown that these centers are indispensable, cost beneficial, and sustainable. They need to be places that people readily come to for meetings, social events, obtaining and sending news, and recording and sharing their histories, experiences, and thinking.

A major weakness in many telecentres is the lack of the evaluation and research needed to provide the real indicators of success. Telecentre managers must ensure that they use surveys, focus groups, log sheets, and the like to continuously monitor the needs, facilities, programs and services, satisfaction levels, costs, and benefits (Hudson, 2001; Whyte, 2000). This will both guide the centres and ensure their sustainability and point the way for others to follow.

CONCLUSION

Telecentres have a great potential to narrow the digital divide in low-income nations. Many different models of provision are employed, and the longer-term benefits are yet to be fully assessed. However, experience suggests that telecentres will succeed where:

- Communities are made aware of and come to clearly understand the benefits of ICT and lifelong learning.
- The centers are strategically situated and easily accessed.
- The managers and staff provide the necessary motivation, support, and guidance for the users.
- The programs and services are in forms and languages appropriate to the communities' needs and contexts.
- The services are widely publicized throughout the local area.
- The technology is reliable, affordable, and user friendly.
- There is a well thought-through business plan and actionable implementation framework.
- There is ongoing support by governments and partnership with other providers.

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KEY TERMS

Cellular Telephony: A mobile telephone service employing a network of cell sites distributed over a wide area. Each cell site contains a radio transceiver and a base station controller that manages, sends, and receives traffic from the mobiles in its geographical area to a cellular telephone switch. It also employs a tower and antennas, and provides a link to the distant cellular switch called a mobile telecommunications switching office (MTSO). The MTSO places calls from land-based telephones to wireless customers, switches calls between cells as mobiles travel across cell boundaries, and authenticates wireless customers before they make calls.

ISP (Internet Service Provider): Middleman between computer users and the Internet. Provides the local phone numbers a computer calls. At each of these, there is a bank of modems, sometimes ranging into the hundreds, connected to a router that allows all the data flowing through those modems to enter and exit the Internet.

Modem/Dial-Up Connection: Most common method of connecting to the Internet requiring connectivity to the Plain Old Telephone Service (POTS) or Public Switched Telephone Network (PSTN).

Telecentres: Multipurpose community-based centers equipped with computers, Internet- and Web-connected computers, audioconferencing, videoconferencing, photocopiers, fax machines, printers, TV and video, cameras, scanners, etc.

Telehealth: ICT-enabled clinical health care, health education, and health administration.

Telemedicine: ICT-enabled exchange of medical information to help doctors, nurses, etc.

Telework: ICT-enabled work, product, or service delivery or communication with employers or customers undertaken in a telecentre, at home, or while traveling.

UPS (Uninterrupted Power Supply): System that prevents power surges or lightning strikes that can cause costly damage to computer parts and unexpected shutdowns.

VSAT (Very Small Aperture Transmission): Earthbound station used in satellite communications of data, voice, and video signals comprised of a transceiver placed outdoors in direct line of sight to the satellite and a device placed indoors to interface the transceiver with the end-user's communications device, such as a PC. The transceiver receives or sends a signal to a satellite transponder in the sky. The satellite sends and receives signals from a ground-station computer that acts as a hub that controls the entire operation of the network.

Wireless in Local Loop (WLL): System connecting subscribers to the public-switched telephone network (PSTN) using radio signals for all or part of the connection. Includes cordless access systems, proprietary fixed radio access, and fixed cellular systems. Also known as radio in the loop (RITL) or fixed-radio access (FRA).

Telecommunication Problems in Rural Areas of Armenia

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BACKGROUND

The Synergy Project "Priorities in the Development of Telecommunications Sector in the South Caucasus" (2003) has the task of modernising the telecommunications system:

- Creation of conditions for free information space;
- Establishing the market of information and knowledge as a factor of production;
- Ensuring informational security of individuals, society, state, and establishing an effective system of free and equitable receiving, dissemination and use of information as a key condition for democratic development;
- Increasing the level of education of the population, the scientific-technical and cultural development of the society by expanding the opportunity of information exchange on an international, regional and national level and, consequently, increasing professionalism and creativity;
- Forming new structures in the public administration, economy, business, culture and social spheres based on massive use of information technologies, computer technologies and telecommunication; and
- Effective use of information resources in the activities of government bodies.

In the rural areas of Armenia during the Soviet authority, the telephone communication system was based on analog stations and a linear network. After many years of operation, the analog telephone stations are worn out, and the linear network is damaged and in the most part is completely destroyed. In spite of the fact that in recent years the infrastructure of telephone communication of the country was considerably improved, one can still see non-uniformity of development of infrastructure between various regions, urban and rural infrastructures of telephone communication, and also between city and other regions of the country and in particular remote villages.

A four-year project of ArmenTel, the telecommunication company with the monopoly in Armenia, aimed to provide 800 villages with a digital telecommunication technology until 1997, but this promise remains unaccomplished. As a consequence, the majority of villages in the country are now suffering information isolation. Add to this, the terrible condition of rural roads, which have not been reconditioned for 10-15 years, and the image of the majority of villages of Armenia in this aspect will be clear. The only communication facility with the external world is television.

Under these conditions, some public and charitable organizations have undertaken their own research on telecommunication problems and on satisfaction of villages' information need. For example, in 2000, as part of the 3PN (2004) within the framework of the "Narod" network project (NNP, 2004) at school #1 of Akhuryan village, we tried to organize an Internet centre which could also be used by small groups of school children from the neighbouring villages, but owing to absence of telephone communication, this idea was not realized. In the same year, with the support of the Bureau of Educational and Cultural Affairs of the U.S. Department of State, the Armenian School Connectivity Programs (http://www.ac2k.am/) (AC2K, 2004) began as part of the Program "Project Harmony" (http://www.projectharmony.am/) and many villages, including Akhuryan, obtained access to such services as e-mail, distance learning and e-commerce. The program creates centres connected to the Internet at schools in rural regions using a basic radio-modem connection, which in the absence of linear telephone communication is the only option for rural areas.

RIGHT DIRECTION OF DEVELOPMENT POLICIES

It is necessary to note, that the creation of a telecommunication network in rural regions by the creation the Internet centres at schools is the right strategy for closing the digital divide as the experience in many countries shows. Despite different socio-economic conditions, in all countries there are similar problems and difficulties:

- Low and insolvent demand of telecommunication services due to small density of the population;
- Significant distances of the villages from the regional centres and truncated relief (sometimes by natural barriers—mountains, gorges, bogs);

- Absence of necessary technical and financial assets; and
- Absence of the highly-skilled specialists.

Irrespective of the development level of the country, the problems of providing telecommunication services in rural areas are similar, and similar solutions are possible—differing in their application, means and fundraising strategies for the necessary resources.

The decision to use the village high school as the telecommunication center was because it is a uniting factor in a village community and is the institution for the preparation of the young generation most receptive to new information technologies. In the present socio-economic environment, the village school is disadvantaged in comparison with urban schools, for example, highly-qualified teachers and specialists do not find rural life attractive. Therefore, a regional computer network for rural educational institutions will be particularly useful for the schoolchildren, the teachers and for the whole rural community. Access to the Internet is a valuable educational information resource for the village school children and teachers, which helps them to prepare for competitive examinations, and is an irreplaceable communication facility that enables dialogue about common projects with colleagues world-wide.

The transformation of villages to be convenient and attractive places to live, is strategically important for the sustained development of the country, and so one should expect effective participation and support by the appropriate state structures and, most of all, by the national government. In particular, the government of Armenia has already decided to sanction local and regional networks of the data transfer in a range of frequencies from 2.4 up to 2.5 GHz in all territory of the country. Henceforth, use of radio-modems and wireless network access in this range of frequencies will provide rural Internet centers with the high-quality Internet services. As the base scheme of regional network development, it is expedient to use the network of TV towers—previously having coordinated this with the TVR Committee. Such a concept for the development of telecommunications in rural region was offered in October 2000, at the international seminar "Conversion potential of Armenia" organized by the International Scientific and Technical Centre in Yerevan (http://www.sci.am/istc2000/).

After the successful development of new communication facility application processes, information and telecommunication technologies can become not only one of the factors ensuring competitiveness of the economy, but also a basis of active regional cooperation between communities and the formation of a uniform economic space in the region.

ACHIEVEMENTS, THE PROBLEMS AND FUTURE TRENDS

Many rural schools in Armenia are supplied with modern computers donated by different charity organizations and private persons. For schools that do not benefit from such initiatives, the organization "Project Harmony" offers an alternative solution: to equip a bus with computers. However, given the condition of our rural roads, we must note that with this equipment (at a cost of US$80,000-$100,000) will not solve the problems. The author believes that it would be more effective to locate computer and telecommunication equipment where it can be in constant use. And for schools deprived of Internet access, training can be offered by means of multimedia programs on CD-ROMs simulating a real Internet network - offering selection from the most popular sites on a disk and using it as one of computers of a server for the local network. This technique was successfully used at the childhood-youth centre "Meghvik" (http://users.freenet.am/~meghvik/) in Gyumri, Armenia.

An acute problem for Internet centres in rural communities (community telecentres) is shortage of expertise. Because of its absence, the directors of schools, being aware of computer breakage and the failure of the programs, often lock away the computers, and then later the computers are obsolete and no longer suitable for work with the new versions of the programs. Carried out by Open Society Institute (http://www.isoc.am/), IREX (http://www.irex.am/), ACCELS (http://www.accels.am/), "World learning" (http://www.worldlearning.am/) and "Project Harmony" preliminary courses have eased this problem a little, but further courses are necessary.

Recently, the Open Society Institute of Armenia (http://www.osi.am/) has developed a community telecenters creation program in rural regions of Armenia, which should help considerably with the problem of information provision in rural communities, thereby reducing the digital divide between the urban and rural population. For this purpose, the Open Society Institute has given a grant to the Armenian association of users CDS/ISIS (http://www.distancelearning.am), which has chosen NGO "Internet Society" of Armenia (http://www.isoc.am) as the partner. The grant was stipulated to prepare the personnel for work at the telecentre - managers, network administrators, operators, and also specialists in training and creation of the programs for training. In addition, a Web-portal for a telecentres network was to be created which all telecentres of the country would use. In the early phase of the grant, there have been approximately 40 telecentres organized in schools. Forty students have completed training on WebCT™, and also use of the Internet for searching for educational resources.

The Internet training was conducted on the basis of a site http://www.teachers.ash.org.au/shansen/wow/. Equipment for the preparation and duplication of a video course was acquired. A Web-portal (http://www.telecentres.am) was prepared on which courses on the preparation of the managers, network administrators, links to the telecentres of the world, and also a list of the telecentres of Armenia, in particular, are published. The level of training and availability of the highly qualified specialists in the sphere of telecommunication defines the quality of telecommunication services delivered to the community.

Another important problem for rural telecommunications in Armenia is the unreasonably high price of the main channels of communication, that is caused by an exclusive condition of the telecommunication market in Armenia. But encouraging changes are planned: After lingering discussions and negotiation of authorities with the management of ArmenTel company, the monopolist in sphere of telecommunications of Armenia, the government decided to cancel from July 2004, the exclusive license of ArmenTel company on the international channels of communication. This means the liberalization of the telecommunications market with new operators in the telecommunications market, the gradual improvement of quality of communication channels offered, and a decrease of the price of telecommunications is expected. All these changes create the preconditions for successful development of regional telecommunications and general application of new information technologies, including in the remote rural communities.

CONCLUSION

For effective functioning of community telecentres, it is necessary to analyze the social, economic, educational, cultural and technical factors in the life of rural community, to find and to develop further expedient ways of development, providing interactive harmony of all the participants and sustained development of the community (RTTF, 2004).

Effective interaction in solving the problems of telecommunication sector can influence the development of the telecommunications infrastructure, including in rural areas. Here it is necessary to pay special attention to liberalization of the telecommunications market and further improvement of the legislation in this important part of the economy (NRRI, 2004).

The main problems include: the improvement and closing of tariff regulation and price calculation, improvement of effectiveness of operator activity, regulating of mutual payments, reforming of the sector management, improve-

ment of the statistical base, assistance in the further development and perfection of the market relations in the telecommunication sector.

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KEY TERMS

Communication Technologies: The branch of technology concerned with the representation, transfer, interpretation, and processing of data among persons, places and machines.

Distance Learning (Teletraining): Training that in which usually live instruction is conveyed in real time via telecommunications infrastructure, that may be accomplished on a point-to-point basis or on a point-to-multipoint basis, and may assume many forms, such as a teleseminar, a teleconference or an electronic classroom, usually including both audio and video.

E-Commerce (Electronic Commerce): Business transactions conducted by electronic means other than conventional telephone service, e.g., facsimile or electronic mail (e-mail).

E-Mail (Electronic Mail): An electronic means for communication in which usually text is transmitted, operations include sending, storing, processing and receiving information, users are allowed to communicate under specified conditions and messages are held in storage until called for by the addressee.

Information: In intelligence usage, unprocessed data of every description which may be used in the production of intelligence.

Linear Network: The specific physical, i.e., real, arrangement of the elements of the network.

Mobile Adviser: The highly-skilled expert, voluntary or on a contractual basis, maintains the regional network of the telecentres and helps the personnel by providing advice and necessary programs.

Network: An interconnection of three or more communicating entities.

Rural Area: Residence of a not urban type.

Synergy Project: A team-developed project.

Telecommunication: Any transmission, emission, or reception of signs, signals, writings, images, sounds, or information of any nature by wire, radio, visual, or other electromagnetic systems.

Telecommunications Infrastructure: The aggregate of equipment, such as radios, telephones, teletypewriters, facsimile equipment, data equipment (computers, modems and other equipment), cables and switches, used for providing telecommunications services.

Telecommunications System: A collection of individual telecommunications networks, transmission systems, relay stations, tributary stations, and data terminal equipment usually capable of interconnection and interoperation to form an integrated whole. The components of a communications system serve a common purpose, are technically compatible, use common procedures, respond to controls and operate in unison.

Telecommunications Sector and Internet Access in Africa

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INTRODUCTION

The "information revolution" has not only transformed the world as we know it, but also its future potential. Information and Communication Technologies (ICT), with their major technological advances, have affected the lives and lifestyles of people across the globe, as well as the way institutions and organizations do business. However, not all outcomes of the spread of information technologies have been positive. A majority of the world's population, especially those who live in poverty, have been largely bypassed by this revolution. The gap between them and the rest of the world has expanded precisely as a result of the facilitation capacity of these technologies for those who have access to them (Figueres, 2003). The majority of these people are situated in the African continent and other developing countries.

According to Jensen,[3] from the study he conducted on the current status of information and communication technologies in Africa, the use of ICT has grown relatively rapidly in most urban areas in Africa. Five years ago, only a few countries had local Internet access, and now it is available in every capital city. In the same five-year period, more mobile cell phones were deployed on the continent than the number of fixed lines laid in the entire previous century. Hundreds of new local and community radio stations have been licensed, and satellite TV is now also widely available. However, the digital divide is still at its most extreme in Africa, where the use of ICT is still at a very early stage of development compared to other regions of the world (Okpaku, 2003).

The history of the development and spread of computers in Africa can be traced back to the 1960's when Ethiopia first introduced computers. This was followed in 1961 in Zimbabwe and Zambia and 1962 in Kenya and Nigeria. The spread of computers and related technologies raised broad a wave of fear about important social and economical issues concerning the loss of jobs. Regardless of this fear, computers became and are the vital tool for economic development of all countries. The spread of these technologies demanded effective legislations which to govern their usage and contributed to the formulation of national information and informatics polices in the 1970' and 80's (Adam, 2004).

In addition to this, during 1992-1996 Africans were introduced to the Internet and this further highlighted the importance of regulation. Most countries adopted policies which favored the promotion of privatization and competition. The period between 1996-2000 saw the birth of broad-based policy formulation around health, education and business. Many African countries adopted policies which allowed people to make use of the ICT to better their economic standard and increase their social status. The incorporation of Communications into Information Technology reinforced the importance of using Information and Communications Technology for development (i.e., e-education, e-health, e-commerce, e-democracy and so forth).

Currently, many African countries are racing towards achieving the Millennium Development Goals by using ICT as part of their development strategy. In addition, the spread of ICT has increased digital opportunities for some and a "digital divide" for the rest, especially in developing countries. It has also given rise to other important development challenges such as achieving real access to telecommunications, incorporating gender equity into ICT programmes, the importance and relevance of Intellectual Property Rights, the need to license VoIP (Voice over Internet Protocol) and VSAT, especially in poor nations, the need for Internet governance, and the right to communicate. Most of these issues were discussed during the first phase of the World Summit on Information Society in Geneva December 2003 and will be further discussed during the second phase in Tunis 2005.

According to the Fair Access to Internet Report (FAIR) produced by the Research ICT Africa (RIA) network[4] concludes that Africa is the continent with the lowest diffusion of the Internet in the world. It has an average of only 111 users per 10,000 people and only three Internet hosts per 10,000 inhabitants (RIA, 2004). This is attributed primarily to the limited penetration, unreliable connections and high costs of usage of typical of the communications infrastructure across the continent. The limited network roll-out and high prices are often attributed to the restrictive policy and regulatory environment and monopoly market structures that persist in many African communications sectors, which have contributed to low levels of competition.

The Research ICT Africa network has recently produced two research reports. The first was the FAIR analysis of Internet access that covered 13 African countries (i.e., Algeria, Cameroon, Ethiopia, Ghana, Cote D'Ivoire, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Uganda and Zambia). The second research report (Sector Performance Review) reviewed the performance of seven African countries' (Cameroon, Ethiopia, Kenya, Rwanda, South Africa, Uganda and Zambia) telecommunications sector at the national level against their stated policy objectives and strategies. The main thrust was to determine which reform strategies are contributing positively to the realization and achievement of development objectives, and which ones are failing.

FINDINGS

Sector Performance Reviews

Though only seven case studies are reviewed in this paper, they reveal that development of the ICT sector continues to be highly uneven within countries and across the continent. What these studies also demonstrate is the lack of availability of statistical data, even from the major government departments and international reporting archives such as the International Telecommunication Union World Development Report Indicators. Further, where indicators did exist, they were often not appropriate to a developing-country context (Gillwald, 2004).

In addition, the report revealed that the primary objective of all countries reviewed was the improvement of access to telephony services, with added commitment not only to network extension but also to modernization of the network in order to meet the needs of the modern economy.

Ironically, at least one of the regulatory regimes that has proven to be effective, has achieved its success as a result of a policy and regulatory vacuum that left the regulator neglected or ignored by central government. Uganda's regulator has emerged as a well-resourced, autonomous body, at least partially because mechanisms were not put in place to provide for its funding or accountability. The regulator set about resourcing itself through levies on the sector, which allowed it to attract and train personnel who could competently deliver on the regulator's legislated mandate (RIA, 2004).

In other cases, regulatory weakness has been a key dynamic. The weak Zambian regulatory regime has been identified as one of the factors contributing to the government's inability to privatize the incumbent PSTN. This, together with high license fees, has impacted on the emergence and sustainability of ISPs (Internet Service Providers) and the penetration of the Internet. Like other

jurisdictions that have to date protected the rights and revenue streams of current incumbents (such as Cameroon, Ethiopia, Rwanda and South Africa), Zambia does not permit the deployment of cost-effective technologies such as Voice over IP (VoIP) outside of the existing incumbent.

In Ethiopia, which has seen some institutional reform since the 1996, legislation separated operations from regulation—through the creation of the Ethiopian Telecommunications Company and Ethiopian Telecommunications Agency. This provides one of the purest examples of state-provisioning, with a strict monopoly on fixed, cellular, Internet services and international gateways. With a regulatory agency that lacks political independence and human and financial resources, the likelihood of Ethiopia's monopoly PSTN being regulated to more effectively meet national needs seems remote. Unlike Uganda, where the loss-earning incumbent provider was viewed as "a yoke around the government's neck" that had to be gotten rid of, the provider in Ethiopia is one of the few revenue streams for the government. As a result, by 2004 the government remained unconvinced that privatization would sufficiently compensate it for any loss of income. For the same reason, the Ethiopian government, like many other governments that have pursued monopolistic models, remained unconvinced of the benefits of liberalization in 2004.

A key area of difficulty in regulating incumbent PSTNs is interconnection. Generally, the problems around interconnection are caused by incumbent providers not being used to operating in a competitive environment or from them being regulated. In South Africa, despite a relatively sophisticated interconnection and facilities-leasing frameworks, the principle (drawn from international best practice) that new entrants or competitors are required by law to acquire their facilities from the incumbent provider and to enter into commercial agreements prior to regulatory intervention, have resulted in protracted negotiations, competition disputes and lengthy legal reviews. Generally, the incumbent monopoly providers have the financial resources to draw out negotiations so that new entrants are forced into agreement or forced out of business. Or incumbent monopoly providers can use their superior resources to tie up the regulator in the courts for years on end, challenging what they regard as unfavourable regulatory intervention. This has been the case in South Africa. In fact, in South Africa, it was a complaint brought by the VANS providers—including Internet Service Providers—to the Competition Commission that resulted in the commission recommending to the Competition Tribunal that the incumbent provider be fined 10 percent of total annual earnings for competition breaches.

The issue of interconnection highlights the need for appropriate regulatory models for developing countries,

where regulators often have restricted human and financial resources. An "access regulation" paradigm has developed globally in response to the emergence of a competitive environment. But under the highly imperfect market conditions that exist in many developing nations—where there are legacies of the "natural monopoly"—this form of regulation is overly resource-intensive and complex. Often the incumbent monopoly provider's position is inherently anti-competitive, either because of the vertically-integrated market structure that inevitably exists or because of formal protection of certain of its activities.

What emerges starkly from the different country studies is the pattern of political, social and economic legacies that determine the ability of a country to respond to the challenges of globalization and, in particular, the so called "digital divide**."** Each study unveils the impact of a country's unique history. So that, whilst facing the already-stark global challenges of new technologies and liberalization, each country has, in addition, to confront the impact of its own history. This includes such events as apartheid in South Africa and Namibia, genocide in Rwanda, years of civil war in Ethiopia, ongoing violent dissent in Uganda, strong neo-colonial tendencies in Cameroon, and the collapse of the "mono-crop" copper economy in Zambia (www.researchICTafrica.net/homepage).

Fair Access to Internet Report (FAIR)

The purpose of this study was to understand the relationship between the market structure and regulatory frameworks, the cost of Internet connectivity and the levels of Internet penetration. The survey strategy was pragmatic rather than exhaustive, aiming to answer the minimum number of questions needed to derive simple yet reliable indexes—of market structure, associated regulatory frameworks and usage prices—which would then allow countries to be compared and ranked. To achieve this, survey tools were developed which aimed to place a value on the regulatory environment and the market structure and to determine the local prices for access Internet services.

The study aimed to develop indicators that would allow for comparison of market structures and costs of connectivity in different African countries. It also aimed to compare various strategies to reduce cost of access, and to understand the relationship between these measures and other development indicators, some of which have the potential to override ICT data (e.g., per capita GDP).

The ICT market structure and policy framework of the entire 13 countries studied were assessed by assigning points on a scale from one to five for a series of seven variables: fixed-line competition; state ownership of fixed-line operators; regulatory strength; technology openness; VSAT; WiFi/unlicensed spectrum; and interconnectivity. These variables were used to generate a comparison of the success of various strategies in reducing the cost of access to communications infrastructure. Equally important was the need to understand the relationships between these measures and other development indicators as indicated above.

The results from the study revealed that the impact of market structure and regulatory framework differs from one country to another, depending on the existing policy, market openness and the wealth of the country. Furthermore, the impacts differ for varying levels of Internet penetration. In South Africa, for example, there were more than 680 Internet users for every 10,000 inhabitants in 2002. This was due primarily to a high per capita income of US $2,542 in 2001 compared to the continental average of US $705 and to some extent due to the openness of the market and the effectiveness of the regulator. In comparison, Algeria, with a per capita income that was two-thirds that of South Africa's, had fewer than 160 users per 10,000 inhabitants. But Nigeria, with a relatively high GDP per capita, had among the lowest number of Internet users, while Kenya had a high number of users with a low GDP per capita. Generally, what emerged from the analysis was that cost of access has a dramatic impact on usage patterns. In terms of telecom prices, the report revealed that the costs of telecom facilities were high in Africa, and they impacted negatively on the usage levels (www.researchICTafrica.net/research).

However, the report acknowledged that other factors including privatization, competition and independent regulation could, and have, impacted on the provision of telecommunications services in Africa.

The report concludes by arguing that Internet growth in Africa was constrained by the low penetration rates for fixed-line telecom services, which set the geographical bounds for Internet participation. Other important factors were: basic access charges for telephone service; the start date of Internet provision, as that determined the number of months/years that Internet services had a chance to grow; access and usage charges for Internet service; disposable income; the extent to which countries had completed their telecom reform processes, prices charged by fixed-network operators to ISPs; the extent of competition in the supply of Internet services to the public; and the effectiveness of telecom regulation in providing a framework conducive to the development and growth of Internet services (www.researchICT africa.net/research).

CONCLUSION

Though there has been some impressive growth and development in ICT adoption in some countries—particularly South Africa and Uganda—there were no cases

of entirely open markets, with monopolistic or partially competitive markets not being regulated in an effective manner. Some markets had slightly more providers than others, and there was no market on the continent that provided a developed model by which to assess competitive efficiency, price reductions and increased penetration rates.

In addition, the report acknowledged that available baseline data in African countries was often inaccurate and did not include the informal sector, which could be highly developed and yet was seldom reflected. The report recommended the development of methodologies and indicators that could reliably draw these activities into assessment.

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KEY TERMS

ICT: Information and Communications Technology generally used in relation to any computer-based processes in which information and content are developed, shared and transmitted over local, regional or international boundaries.

Internet: A world wide interconnection of individual networks operated by government, industry, academia, and private parties.

ISPS: Internet Service Providers provide access to the Internet via different communications channels such as traditional telephone lines or high-speed fiber-optic channels.

PSTN: Public-Switched Telephone Network, consist of analog local loops that connect subscribers to the local central office, and digital facilities that link central offices together via various regional, long- distance, and international backbone.

VOIP: Voice over Internet Protocol applications send telephone voice calls over the Internet inexpensively, by transforming people's voices into packet-based data.

WIFI: Wireless Fidelity networks use small, low-power antennas to carry voice and data communications between a backbone and users at schools, businesses, households and public places, all without laying a single wire, thus greatly reducing the cost of "traveling the last mile."

ENDNOTES

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[4] Research ICT Africa is an ICT policy and regulatory resource base and research "collaboratory" for decision-makers in the public and private sectors and civil society, developing public-interest research findings through the networking of researchers at African universities. Built through the development of collaborative relationships among African institutions in Botswana, Cameroon, Ethiopia, Kenya, Mozambique, Namibia, Nigeria, Rwanda, Tanzania, Uganda, Zambia and South Africa, the network has linked with prestigious international research networks, such LIRNE.NET, to create rigorous and independent research in the public domain.

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Telework and the Canadian Environment

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INTRODUCTION

Information and communication technology (ICT) is constantly changing the world around us. This not only affects the way that we conduct our personal lives but also our business lives. It is changing the very make up of society (Neff, 2000). For organizations, it seems that there is a requirement for success that they ride along with the new technological wave or risk getting left behind. As a result, some organizations are implementing telework programs to take advantage of new technologies (Kaye et al., 2000).

Telework has been found to be not suitable for all companies, even if it is technologically possible (Perez et al., 2002). There are many factors which can determine whether a telework program is going to be a success or failure and these factors should be carefully considered before telework programs are instituted. As will be shown in this paper, telework is being adopted by an increasing number of organizations around the world, and this trend seems to be increasing.

A study released by Statistics Canada (2003) found that in 1991, there were over 600,000 teleworkers in Canada. This number grew by over 67% to 1,000,000 teleworkers in 1997. The General Social Survey (GSS) published in 2000 shows that this number had increased to 1,400,000, which equals 10% of all those employed. As this trend continues, it becomes important to understand exactly what telework is and how its use can benefit both employers and employees.

This article will consider different aspects of telework, including its definition, using examples from Canada and around the world, its costs, challenges, benefits and opportunities. It will conclude with a discussion on whether teleworking in Canada can be a viable option for an organization.

DEFINING TELEWORK

Telework is an alternative work arrangement that is conducted in a location away from the traditional office, that is, in an employee's home or satellite office. The location of the teleworker can vary from a rural tele-center or tele-cottage to a company satellite office that relies upon communications with head office while retaining many of the work patterns of the conventional central office (Fulton, 2002).

A teleworker communicates with the central office utilizing ICT such as telephones, cellular phones, fax machines, and modems. Telework *does not* include occasionally being out of the office for meetings, nor does it include overtime hours completed at home after a day in the office even when communication with the office occurs.

Three main categories of teleworkers exist: part-time, full-time, and mobile or location-independent workers (Hobbs & Armstrong, 1998). The part-time teleworker is an employee based in an office but who spends two or three days per week working from home. The full-time teleworker is an employee who works at home for the majority of the working day, visiting the central workplace only occasionally. Full-time teleworkers can include such occupations as computer programmers and systems analysts who work entirely away from an office. There are also mobile and location-independent teleworkers who spend most of the work day outside of their home and office, meeting with clients and potential customers. Sales professionals, service engineers, tradesmen, and consultants typically fit into this category of teleworkers.

TELEWORK ACROSS COUNTRIES

In Canada, according to the General Social Survey, in the year 2000 nearly 2.8 million people, (1.4 M employees and 1.4 M self-employed) worked at home (Akyeampong & Nadwodny, 2001). According to Williams (1991) as cited in Fulton (1999), Canada has the potential to successfully integrate telework because of a small, highly urbanized population and an advanced well-regulated telecommunications infrastructure. Several large Canadian corporations have experimented with telework including DuPont Canada, Esso Petroleum, Nortel, and Bell Canada (Fulton, 1999).

The reasons for using telework in these companies included cost-savings and downsizing efforts. The Canadian government has also undertaken several trial telework arrangements with employees to examine its costs and benefits, and has supported the use of telework as a work arrangement alternative (Fulton, 1999). Solomon and Templer (1989), cited in Fulton (1999), found that 21% of top earning companies in Canada had implemented telework, or were planning to in the future.

In the United States, environmental concerns are a primary reason firms make telework arrangements. Legislation to reduce smog, such as the Clean Air Act, has been introduced in different parts of the country. In Britain, studies have found that teleworking is frequently used due to child care requirements. Telework allows a parent to care for a child while also being employed

Telework has been growing in Germany and other European countries, with over 40% of all working Europeans expressing interest in such a working arrangement (Fulton, 1999). Korte and Wynne (1996), as cited by Fulton (1999), found that the use of satellite offices had increased from the 1980s focused on working at home, through the 1990s using neighborhood centres.

In Australia, a teleworking study found telework to be a viable working alternative for women, but the lack of resources including training, facilities, child care and domestic responsibilities, has caused significant problems (Fulton, 1999). Suggestions for resolving such issues included investments in satellite or neighborhood centres to counter these negative aspects (Ilozor & Ilozor, 2002).

Sweden, has long been recognized for its forward thinking approach in terms of equity in working and family conditions for men and women, focused on using satellite and neighborhood centres for telework (Fulton, 1999) to "…combine the breakup of organizations with the maintenance of social relations outside of the organization" (Fulton, 1999, p. 49).

ADVANTAGES AND DISADVANTAGES OF TELEWORK

When considering whether or not to adopt telework practices, employers must evaluate all options based on financial information as well as the social and psychological factors (Ward et al., 2001). There are shortcomings and challenges that exist for managers and employers alike (Tremblay, 2002; Harpaz, 2002).

Managers strive to achieve an environment that is supportive for their employees but may find it difficult to manage when employees are away from the office. (Armstrong, 1998; Watad & Peter, 2003). Job design,

attitude and expectations present challenges for managers in successfully conveying them to the employees so that they can meet company objectives. The employer is faced with the task of demonstrating that the employee knows and understands exactly what is involved in telework (Wicks, 2002).

The supply and maintenance of ICT equipment and its operation for telework can require a significant financial contribution from the company. However, depending on the agreed upon telework arrangement, employees may be required to finance their own office equipment. In addition to these financial considerations, there is a security threat presented by the use of the Internet outside of company firewalls for communication purposes (Pliskin, 1997; Akyeampong & Nadwodny, 2001).

When employers are evaluating whether or not to implement a telework program, they often complete a cost-benefit analysis to weigh the advantages and disadvantages associated with setting up the arrangement. (Clean Air Campaign, 2002). These costs include candidate selection, preparation and training, network configuration, computers, printers, company software and technical support for employees. Some of the psychological considerations for employers when considering implementing telework include:

- Adjustment of employees' supervision (Treasury Board of Ontario, 1999),
- Evaluation of employees on end results and final projects,
- Establishment of regular communication with employees,
- Providing a supportive environment for workers (Armstrong, 1998),
- Planning and implementing the telework program, and
- Determining which jobs are appropriate for telework arrangements.

The issues raised above are important for the mental well-being of the employees to ensure there is a way to achieve a sense of belonging and commitment to the company and its culture.

According to European Telework Online (2000), it is important to distinguish between professional and clerical positions. This distinction is critical because those workers in clerical positions generally require more direct supervision, which suggests they would not be suitable candidates for a teleworking position. Ideal teleworkers are self-motivated, demand minimal amounts of direct supervision and exhibit good time management. Employers are faced with the task of seeking workers who fit this description. Their main goal in this challenge is to define exactly what the company is looking for so that those

selected can successfully fit into the teleworking position in the company.

Corporations today need to alter their business structures and strategies to keep up with the fast-paced and continuously changing business environment. Telework grew out of the need for companies to adapt to the changing business conditions. As the advantages of telework become evident, more companies are transforming and adopting this new type of working arrangement. Table 1 lists the main potential benefits of teleworking for employers and employees.

In a study of over 5,000 Canadians, telework was found to be growing quite considerably (InnoVisions Canada, 2002). In Canada, 11% of those employed work from home, and more than 40% of them work part-time. The study also revealed that more than 50% of Canadians have an interest in working from home. Organizations cannot ignore these trends if they are to be competitive in the business world.

But the question remains: Have employers benefited from telework arrangements? Nortel has found a 24% increase in productivity from their teleworkers, 40% of whom are located in Canada (InnoVisions Canada, 2002). Both IBM and Industry Canada have reported a 50% increase in productivity and Digital Canada also reported increases (InnoVisions Canada, 2002). On average Canadians miss 10 days of work per year because of illness, child care and eldercare and this will only be increasing as our population ages. Organizations have attempted to respond to these needs by implementing telework (Harpaz, 2002; Tan-Solano, 2001). Telework can improve workforce productivity because it permits employees to schedule their work to accommodate their personal needs, rather than conforming to specific work schedules (Mitchell, 2001).

Typically, teleworkers have been said to work more efficiently because they have no office-related distractions. But the challenge becomes to resist the many distractions that exist in a home environment such as children, television, and incomplete housework. This in turn also affects the performance outcome of the employee and stresses the importance of valuing the finished product in assessing performance, not necessarily the process of its completion which has formed a component of office-based work evaluations. Reports of productivity increases are as high as 95% with telework, attributed in large part to the elimination of general work day interruptions (Public Ser-

vice Alliance of Canada, 1999). Furthermore, the Bank of Canada found that in an evaluation of 100 bank teleworkers, teleworking was found to be successful at decreasing company expenses (InnoVisions Canada, 2002). According to Bob Fortier, President of the Canadian Telework Association (CTA), organizations could save approximately $2,000 per part-time teleworker per year.

However, in order to be successful, employers must take into account some of the downsides of teleworking (Tan-Solano, 2001). Employees involved in a teleworking arrangement may suffer from social, financial and psychological detriments that stem from their work-related responsibilities. Some individuals may experience a sense of isolation from the office environment due to the reduced social contact with their colleagues (Vega & Brennan, 2000).

Although additional efforts are required to maintain communications and good working relations with colleagues, some teleworkers are concerned that by decreasing their visibility in the office, they limit their career potential (Treasury Board of Ontario, 1999). E-mail and the Internet give employees the flexibility to work from home, but some employees find the arrangement too isolating.

The Editorial Eye (2002) reports that telework can reduce the seniority accumulated in a corporation which will effect wages, salary, pension plans, paid vacation time, the order of lay offs, eligibility for promotions, training and educational leave. Once accustomed to it, it may be extremely difficult to leave the conveniences such as autonomy and flexibility in scheduling that telework can provide (Hobbs and Armstrong, 1998).

EXISTING POLICIES

There has been a growing amount of literature regarding the telework policies and practices that exist in Canada in response to the increasing need of Canadians to balance work and family life. The Canadian Telework Association (CTA) was established in 1997 in an attempt to minimize costs by working from remote locations, rather than in a central office space. Despite the fact that the CTA receives no funding or grants from the government, they have been a sustainable company and continue to prosper (CTA, 2004).

Table 1. Main potential benefits of teleworking for employers and employees

Employers' Benefits	*Employees' Benefits*
Improved productivity	Higher levels of satisfaction
Increased employee flexibility	Decreased stress levels
Reduced levels of absenteeism	Better work/personal life balance
Improved employee retention and morale	Higher confidence and self-esteem
Decreased overhead costs	Reduced travel and parking costs

Information regarding Canadian telework policy can be found at the Treasury Board of Canada Secretariat. This policy, which became effective on December 9 1999, describes some of the internal advantages of implementing a teleworking arrangement. Externally, teleworking is also considered to be successful in reducing traffic congestion and air pollution.

In the application of telework policy, it is the duty of both managers and employees to ensure the operational needs of the organization are being met and that productivity costs are minimized (Helms & Raiszadeh, 2002). In general, a company must establish a formal policy in order to provide equitable treatment and opportunities for employees (Work-Life Research Center, 2003). The main characteristics of the Canadian Telework Policy are:

• Qualifications of the teleworker to be established by management;
• Teleworker's responsibilities and obligations should be outlined in the agreement;
• Efficient managerial support and performance monitoring techniques must be in place;
• Policy must be clear in the work assignment detail and supervision standards;
• Costs of equipment may be absorbed by the organization, depending on agreement; and
• Final agreement should include a precise job description.

One problem with the current work standards in Canada is that the Employment Standards Act does not clearly define teleworkers. The closest definition to teleworkers is that of the home workers which are described as, "…employees who do work such as word processing, telephone soliciting, online research, sewing, manufacturing, or preparing food for resale in their own home for an employer" (Ontario Ministry of Labor, 2003).

The legislation points out guidelines to be followed by organizations regarding the several different types of employees. Major guidelines include minimum wage, hours of work, parental/maternity leave, and vacation time.

MAIN RECOMMENDATIONS

There are more advantages than disadvantages in adopting telework initiatives and Canada appears to be keen to provide an environment to capitalize on the benefits of telework.. Successful teleworking arrangements include supportive managers, comprehensive guidelines and objectives as well as a critically researched and thoughtful selection of telework employees (Parasuraman &

Greenhaus 1997; Ilozor, Ilozor & Carr, 2001). The majority of the successful telework arrangements had a contract in one form or another.

Legislation similar to the Clean Air Act in the United States could be instituted in Canada, to encourage companies to implement telework whenever feasible. Fewer commuters results not only in less pollution but also in reduced road repairs, highway maintenance, and transportation infrastructure investment requirements. Telework also has the potential to reduce energy bills at corporate offices.

From a social context, telework can help companies respond to changes and accommodate the needs of their employees and society. With the increase in dual income families, there is more stress on both working partners to balance work and family life, and telework can reduce such stress. Telework can also accommodate the needs of individuals with disabilities.

While some studies seem to indicate that ICT in general and the Internet in particular create social isolation (Kraut et al., 1998), others indicate that the opposite is true (DiMaggio et al., 2001).

The evolution of ICT and the Internet have brought about the advent of telework, something unimaginable just 50 years ago. While the loss of face-to-face contact will undoubtedly contribute to some feelings of isolation, new and improving methods of communication, such as video-conferencing, have brought new meaning to the ways in which people work while making it easier for employees to interact with associates even though they are not in the same physical space (Ahmadi, Helms & Ross, 2000). A summary of recommendations for a successful implementation of a telework program include:

• Income tax considerations to encourage teleworking;
• Well-structured contract between employer and employee;
• Rigorous screening process to ensure adequate employees;
• Orientation and proper training for both employer and employee;
• Work with, as opposed to against, collective bargaining agreement;
• Fair promotion throughout company; and
• Human resources professionals with proper training in telework management.

CONCLUSION

The purpose of this article has been to examine the various aspects of telework. The authors conclude that with the proper framework, employees, and management, success-

ful telework is possible, but that the success of implementing this arrangement depends on the attitudes of all parties involved.

Overall, telework has been positively received in Canada, from employees and employers, as well as the Canadian government. While telework is still in the early stages of development in Canada, support from government officials shows that it is encouraged and highly valued by the Government and that it provides benefits for the Canadian economy.

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KEY TERMS

Information Technology (IT) or Information and Communication Technology (ICT): The use of computers to convert, store, process, transmit, and retrieve information.

…

Internet: The vast collection of interconnected networks that all use the TCP/IP protocols.

TCP/IP Transmission Control Protocol/Internet Protocol: This is the suite of protocols that defines the Internet.

Telecenter: A multifunctional office area outfitted with communication and information processing equipment using computer assets with access to telecommunication networks.

Telecottage: A "community based" facility to assist learning, access to technology, and access to work.

Teleworking: "Tele" derived from the Greek word "tale," meaning "from a distance" (IVC, 2003).

Video -Conferencing: Conducting a conference between two or more participants at different sites by using computer networks to transmit audio and video data.

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Transforming Democracy through ICT

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INTRODUCTION

This article explores the potential of ICT to be used to transform the processes of citizen engagement such that a citizen-centred approach to e-democracy becomes both viable and desirable. It will do so by exploring three tensions relating to democracy and civil society: first that participation in traditional democracy is falling, yet new technologies are mobilising citizens on a global and local scale (such as antiglobalisation protests and electoral protests in the Philippines and Spain); second, ICT increases the technocracy of government but also offers citizens a chance to become closer to it; and third, that macro strategies for ICT access are not enough to remove localised exclusion.

The transformation of government and democracy toward online models does not predetermine that our communities will be strengthened or that satisfaction in or engagement with civil society will increase. The potential success of technology in this field lies in its value as a tool or conduit, the ability of technology to remove barriers of time and space and to provide access to information. To do this effectively, we need ICT solutions that transform the processes of civil society such that citizens are privileged at the centre of the discourse and so that systems and processes are citizen-centred. This article will attempt to resolve these tensions through the description of a simple evolutionary framework that privileges activities at the citizen-led end of the continuum. The model can be used to identify issues, maturity, and progress of ICT in a community or group of communities and act as input into the development of policy and localised models for community ICT that privilege citizens.

BACKGROUND

Observers such as Putnam (2000) note that engagement in traditional community activities has been declining since the 1960s. Although this decline is mirrored in the political realm, Coleman and Gøtze (2002) see a drift away from participation as having more to do with apathy brought about by the increasing technocracy and perceived distance of governments, rather than apathy for democracy itself. ICT, they and others suggest, offers the potential to dramatically change the processes of government and the interactions between government and citizens (Coleman & Gøtze, 2002; Mälkiä, Anttiroiko, & Savolainen, 2004).

The potential for citizen-led agencies to successfully harness new and emerging technologies in order to subvert hegemonic discourses can be been seen in the role that text messaging played during the 2001 Presidential Elections in the Philippines. SMS-enabled mobile devices are now considered ubiquitous in Manila, and a technology-savvy subculture is able to effectively utilise the Internet and new mobile technologies (Quintos de Jesus, 2002). On this occasion, the actions of over a million citizens were coordinated, and street demonstrations organised in what became known as the Manila "People Power II" demonstrations. These events led directly to the downfall of the regime of President Estrada. The 2004 terrorist attacks on Madrid's rail system occurred days before a general election. While Spain prohibits political demonstrations during the 24-hour period before an election, Spanish citizens used text messaging to self-organize spontaneous demonstrations. Text traffic was 20% higher than normal on the day before the election and 40% higher on election day (Rheingold, 2002, 2004). On a local scale, Williamson (2003) discussed how community activists were able to subvert a political discourse through the use of a Web site and online publishing: A study of housing development in an environmentally contentious area commissioned by Waitakere City Council surprisingly came out against all but a very limited amount of further subdivision. The prodeveloper council attempted to hide the report, refusing to publish it, and, even when forced to by a Parliamentary Commissioner, the city council made access difficult. Obtaining a copy of the report, community activists then scanned and published it on two local Web sites. E-mail networks were used to widely publicise links to the report. Those with access to the Internet were encouraged to print and distribute the report, thereby ensuring as wide a circulation as possible of this controversial public document.

MAIN THRUST OF THE ARTICLE

News media has long been considered a bridge between the public (and public opinion) and government, yet today it offers little more than "an uneasy compromise

between quality and popular news discourses—that represents the worst of both worlds" (Atkinson, 2001, p. 317). This reduction in diversity has occurred alongside a dramatic increase in the management of news, leaving only limited opportunities for citizens to express their own views (Gustafson, 2001). Technology clearly offers citizens the potential to reclaim their voices at a time when there is ever-increasing decentralisation of decision making away from elected representatives toward "experts." In this new technocracy, decisions are based on science and professional knowledge, not public opinion (Mälkiä et al., 2004). The Internet is a powerful tool for connecting people with information. ICT is valuable when harnessed (like other media) for communicating a message; however, it also extends the traditional concepts of media into an interactive experience, where the views of many can be expressed and potentially disseminated widely. It is this potential that sets ICT apart from traditional print and electronic media and that offers great potential for citizens to become more involved in the political and democratic processes.

Schuler (2000) observed that ICT provides tools for strong democracy, such as e-mail, forums, and online access to documents. Organisations such as Minnesota e-Democracy (www.e-democracy.org) and the Waitakere E-democracy Group (www.wedg.org.nz) demonstrate the potential for citizen-led engagement. Examples of top-down, government-led initiatives include Brisbane City Council, Camden Council (UK), and Rutland County Council (UK) (online fora), the Queensland and Scottish Parliaments (e-Petitions), and Estonia, Queensland, and Camden Council (broadcasting of legislature and executive). In 2002, Ronneby (Sweden) created an e-democracy Web site and discussion forum with the intent of increasing interest in the upcoming municipal election. Council candidates were able to present their views, and the public could enter into online discussions. An evaluation of the project rated it as a successful pilot, and it was well received by citizens, however, it was not successful in increasing voter turnout (Ronneby Kommun, 2002). While many of these examples are aimed at engaging online with those already engaged in the democratic processes, Queensland has also gone further, creating a Web site for the State's youth to connect with government (www.generate.qld.vic.giv.au).

While the rhetoric of government values engaged citizens and governments feel the need to solicit "feedback in order to develop good policy and services at all levels" (Office of the e-Envoy, 2001, p. 1), citizen involvement should not be assumed. Ranerup (2000) observed that, while on-line fora can be initiated by governments, the community, or other active stakeholders (such as researchers), her own experience of Swedish local government was that citizens, while seen as participants in a forum, were not necessarily consulted

over its establishment and design. This highlights a gap between the technocracy of public administration and the desire of those citizens interested in democratisation and the revival of representative bodies (Chadwick, 2003).

Although most developed countries have an e-government strategy, there is no clear articulation of the link between the often-stated efficiencies gained in the delivery of government services and strong democracy (Coleman & Gøtze, 2002). There is a discourse within governments that sees e-government as a tool for the management and delivery of services from the centre out. While the New Zealand e-Government Unit observed that "new technologies will enable easier access to government information and processes. People will be better informed and better able to participate" (2003, p. 1), the strategy for achieving this identifies only three limited objectives:

- Make government information easier to find.
- Publish key government information online.
- Provide multiple channels for contact with government.

ADOPTION OF TECHNOLOGY

ICT is not ubiquitous, and clearly, a significant number of citizens remain excluded from the "information economy." Many more are yet to acquire the skills needed, first, to become effective users of ICT (Gurstein, 2003), and, second, to become producers of information, news, and knowledge.

The Australian Government noted that in June 2003, 62% of people in metropolitan areas and 53% of those in nonmetropolitan areas had accessed the Internet (a total of 59% of all Australians). They observed that 55% of the Australian households had Internet access in the home. Although these statistics show encouraging growth over previous surveys, they still point to 45% of Australian households having no Internet access. Only 7% of this group are able to access the Internet elsewhere, and the overwhelming majority cite the high cost (25%) or a lack of interest (25%) as the reason for no Internet access (National Office of the Information Economy, 2003).

Beyond statistics, Zhu, Taylor, Marshall, and Dekkers (2003) observed that, in considering the adoption of ICT, it is important to consider the microlevel motivators, both societal and personal. They suggest that individuals need to first be aware of and then motivated to want to use ICT, and, subsequently, that it is important that individuals and groups are able to identify value in its ongoing use. As Moore (1999) suggested, adoption is based on an individual's perception of the value and

attributes of technology, and the discontinuity of change caused by ICT adoption can itself act as a barrier to uptake and ubiquity.

FUTURE TRENDS

As new ways of communicating supported by ICT emerge, it is necessary to reconceptualise the way we communicate and engage in democracy. While technology can lead to the privileging of experts, it also offers the potential to transform democratic processes from government-led to citizen-led. E-democracy, Chadwick (2003) suggested, is about scale, rendering convenient access to participation beyond traditional constraints of space and time. ICT must become ubiquitous for e-democracy to be effective, and barriers to ubiquity can be technical, economic, cultural, social, or political. Where local communities can become effective users of ICT and active producers of their own content, it is demonstrably possible to affect change and influence local political decision making (Williamson, 2003). The challenge for policy makers and practitioners alike is that many communities do not have equitable access to ICT, not all citizens are ICT literate, and many communities and interest groups lack the knowledge and skills to be effective users.

The community ICT model described here draws on literature that includes Patterson's (1997) four interconnected nodes (design, access, critical mass, and impact) and O'Neil's (2002) meta-analysis of community ICT studies, which reveals five key areas of research: strong democracy, social capital, individual empowerment, sense of community, and economic development opportunities. Day's (2004) three components of community informatics (policy, partnerships, and practice) are considered, which he underpins with a framework for the democratic design of community ICT initiatives. Day asserts that communities need to be empowered before they can campaign for their own interests and influence community policy, and they must create a "democratic community planning agenda" (Day, 2004, p. 33) by defining the critical criteria for successful and sustainable community ICT projects.

Practical experience informs the design of this model. In particular, discussions held on the Waitakere E-democracy Group Discussion list and within the Waitakere City Council EcoTech Working Party have strongly influenced its design. This draft model is strengthened by drawing on the evolving New Zealand National Information Strategy (Library and Information Association of New Zealand Aotearoa, 2002). Although the LIANZA model is developed locally, it is, in part, derived from UK

Figure 1. Five-stage model (Williamson, 2004)

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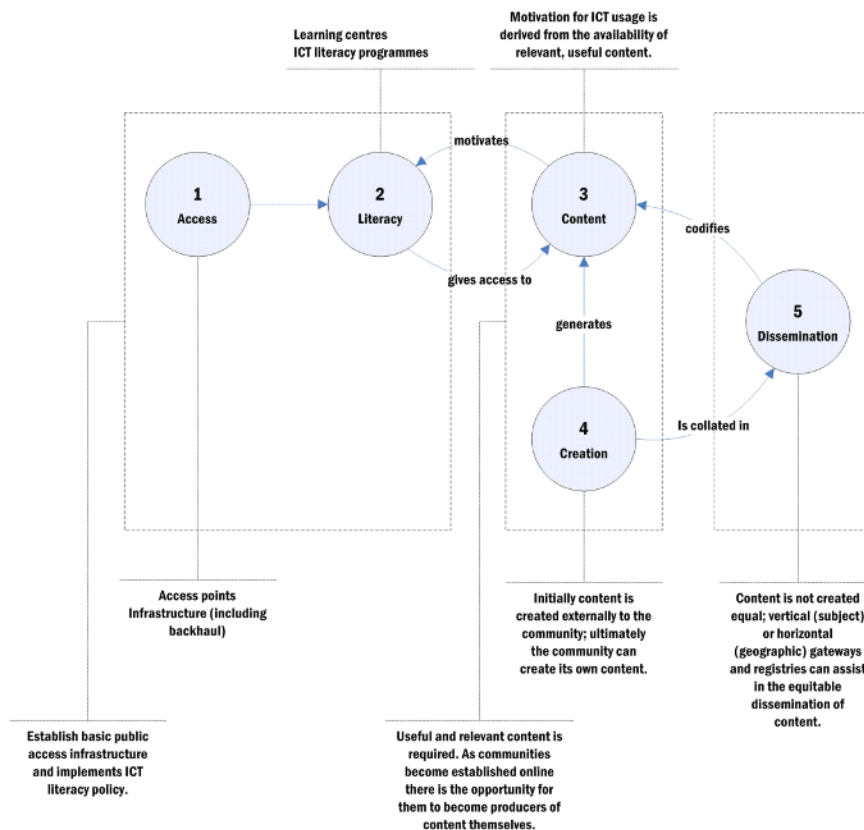
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models for library and information strategy. It has three core levels:

- Knowledge Access/*Te kete tuätea* (infrastructure)
- Knowledge Resources/*Te kete aronui* (content)
- Knowledge Equity/*Te kete tuauri* (empowered access to information) (Library and Information Association of New Zealand Aotearoa, 2002, p. 8)

This then extends to encompass issues of continuity and collaboration. The LIANZA model appears to be information centric, rather than community or people centric.

The temporal model shown in Figure 1 identifies five stages of maturity for the use of ICT within communities and can be used as both an assessment tool (for current maturity) and as a planning or policy development tool. Each of the five stages recognises an increasing maturity and sophistication in ICT usage, however, the model should not be seen as linear; the target is not to reach stage five, rather to ensure that technology is being applied in a way that is seen as appropriate to the community in question at a point in time (either present or future).

Stages one through four occur within communities. They are not necessarily formal and are not entirely dependent on each other. The requirements and relative importance (or even existence) of a stage are related to the maturity of ICT usage. In other words, each of the four stages, while to some degree reliant on its predecessor, does not require that prior stages are or were formalised or even articulated. (There is likely to be a continuum between a *laissez-faire* approach and formal strategy or policy initiatives.)

Stage 1: Access

It is not lack of access that causes the digital divide but the consequences of that lack of connection (Castells, 2001); hence, strategies are required to ensure equity of access and opportunity. Citizens must have basic access to ICT. This could be through private ownership, community ownership, or privately owned access points. Stage 1 can be subclassified in terms of the nature, cost, and availability of access.

Stage 2: Literacy

It is not enough that we simply provide community-based ICT resources. It is imperative that those in the community whom the technology is intended to benefit are trained to make effective use of it. As the generation of knowledge supersedes physical production in the postindustrial age, literacy can be judged at two levels: basic literacy and literacy in ICT.

Stages 1 and 2 are not necessarily formal; if access and literacy are already present or if no policy/strategy addresses them, they could be ad hoc, however, this requires individual motivation. Formal strategies are more likely to be needed where other socioeconomic factors restrict opportunities for access.

Stage 3: Content

For ICT to be useful and for communities to be motivated to use it, material and services must be available online that are of a perceived value to the community. Communities must be aware of such information and services and have access to them.

Stage 4: Creation

Communities have the knowledge, skills, and facilities necessary to produce and publish information themselves and to repackage or highlight information that is directly pertinent to them. Logically, Stage 4 must have occurred elsewhere to provide usable and useful material for communities entering Stage 3.

Stage 5: Dissemination

The final stage, Stage 5, is a meta-stage, occurring beyond individual community boundaries. As communities become publishers of new knowledge, society risks becoming overwhelmed with information. At present, there is also a reality that some information is more readily available and accessible than others (because the producer is more widely known or because of search engine bias). In a truly participative model for community ICT, processes need to exist to ensure the fair and equitable dissemination of information (that is being received at Stage 3 and created at Stage 4). Examples of such models might be portals or more likely would involve meta-data, meta-indexes, and registries.

Stage 5 becomes viable and appropriate once critical mass has been reached at Stage 4. Dissemination can then take place via fora that are geographical (by city, region, country, etc.) or topical (democracy, environment, social services, etc.). At this level, a clearly defined taxonomy is vital, and the use of agreed upon standards for metadata becomes important (Surman, 2002).

The five stages (access, literacy, content, creation, and dissemination) are temporal and nonstatic. Community A can be a newcomer to ICT, getting up to speed with computers in a new learning centre. However, they require content to make the technology useful. This is potentially delivered by others locally or elsewhere who are already creating content. At some point, some members of Community A become both literate and motivated enough to

publish their own information: stories, histories, and news. Once enough vertical or horizontal communities have become publishers, it becomes viable to offer a collated dissemination service, by way of a portal or gateway or through online registries. The potential of this model is that it empowers communities by creating a transferable road map that acts as a good to assess where a community is currently situated and provides direction for future strategic development.

CONCLUSION

This article has explored the tensions that exist in the use of ICT to support engagement in the democratic process: falling participation vs. ICT as a tool for citizen-led engagement; technocracy vs. closeness of the citizen to government; and centralised models of access leaving some citizens behind. It proposes a model based on localised solutions that privilege the position of the citizen at the centre of democratic discourse. Inherent in this is the recognition of ICT value in supporting localised solutions to transform the processes of citizen engagement.

The relative low cost and increasing ubiquity of ICT means that communities can now realistically expect to be able to publish their own stories and create citizen-led initiatives to influence and interface with governments. However, this does not become truly democratic until the barriers to ICT ubiquity have been overcome. Policy is required to promote ICT literacy as a life skill and ensure that access is available to all who want it. However, localised solutions are vital; no two communities are alike, and the model presented in this article is designed to act as a broad road map, assisting communities in identifying their own paths to becoming effective users of ICT and for measuring the effectiveness of community ICT projects. Equally, this model can inform policy makers in terms of recognizing the critical phases of ICT maturity within a community.

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KEY TERMS

Access: Citizens have access to the technology they need. Access is both physical (ICT is located at a physically appropriate place, such as in the home, community centre, library, or school) and economic (it is affordable).

Citizen-Led E-Democracy: Bottom-up, transformative process. Citizens create and sustain ICT applications, including e-mail lists, discussion boards, chat, and Web sites, etc., that accurately capture and reflect the discourse of citizen. Such fora can be vertical (subject) or horizontal (geographic). Such an entity must be able to influence government actions either directly (through shared involvement) or indirectly (through public, media, or political influence). Citizen-led e-democracy involves governments "working with," rather than "delivering to" citizens.

Content: Online material or services that are relevant, useful, and timely for the community and that are made available in appropriate and affordable ways.

Creation: The ability and opportunity for communities to create and publish their own online content that actively reflects their own position and that is inherently counterhegemonic.

Dissemination: Because information is not created equally, it must be codified and aggregated such that one producer of knowledge is not privileged over another. For example, a city portal where all community information is collated or republished.

E-Democracy: The electronic process through which citizens engage with government and its agents (and vice versa), including consultation and voting. E-democracy is a two-way process that can be driven by either government or citizens.

E-Government: The provision of information, transactions, and services between government agencies and from government to citizens and businesses. E-government encapsulates the electronic delivery of government "business" from the centre out (governments "doing to" citizens).

Government-Led E-Democracy: Top-down, change process. Governments create points of electronic interface in order to consult or capture opinion from citizens. This is most often a change process—a new way of recreating existing communication and consultation models, for example, consultation on policy issues or planning processes and clinics with politicians.

Literacy: Citizens have the skills to use ICT effectively to meet their needs. In policy terms, ICT literacy should be considered a basic skill alongside traditional literacy. Strategies are required to achieve equity in this area and ensure that existing educational, geographical, cultural, or socioeconomic barriers do not exacerbate the digital divide.

Trans–Urbanites and Collaborative Environments in Computer Networks

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INTRODUCTION

Since the first manifestations of what was agreed to be called civilization, humanity has been considering cities and urbanity relations the main centers for socialization and political interaction in people's lives and daily activities. The birth of cities allowed the formation of cooperation groups, which despite being created from shared work and urban social duties, got together for the same objectives in their communities and were interdependent. Nevertheless, many times such groups were under tension and conflict as contingent residence places and shared geographic centers were rarely based on interests in social interaction, or sharing projects and affectivity. Therefore, cities were consolidated as centers for socialization, and manifestations of interests and collective interrelations, as well as privileged stages for social constructions, disputes, conflicts and witnesses of social histories.

Thus, cities were born for politics and have always had administrative roles as their main vocation. The first cities were always capital cities, centers for decision-making and power. And today it is not different: population, production and service concentrations create the conditions for power and governments to be in them. Therefore, cities have the role of capitals in empires, countries, states, departments, or at least of administrative headquarters in municipalities. Cities became notable, and mingled as centers for decision-making and administration in the most diverse human groupings.

The roles of cities as centers for socialization and decision-making have never been questioned or thought of as being possible in other settings other than in an urban one. Since their emergence, the first cities have always been the centers of everything. By the end of the 20th century, however, the birth of a computerized society, as well as social interaction network environments have produced several communities assembled in virtual centers and electronic environments, but able to construct real relationships and make decisions with concrete influences, which ended up in extrapolating the classical model of urban socialization and politics, creating possible trans-urban communities for the first time in history.

Although in a preliminary way, this article covers the analysis of these trans-urban centers, socialization and common interests communities, whose motivational formations are based on interests, desires and willingness for socialization by their members, instead of on contingent geographic territories, physical region of residences and shared productive resources.

Therefore, an investigation of the transformations and possibilities of these new centers for socialization, power and human administration, network communities, is proposed.

BACKGROUND

There are many studies on urbanity and its role in human society. In principle, it is admitted that cities have been the center of human social relations since their birth sometime between 5,000 to 10,000 years ago.

According to Milton Santos, a city is an organization aimed at collective production (Santos, 1994). Even though apparently disorganized and confusing, cities are always well-articulated sets of equipment and urban-productive solutions.

In this sense, interests and temporalities overlap. Neighborhoods and older structures coexist with the addition of new urbanities and productive roles. Anyway, it is not difficult to perceive the existing contraction in the cities: on one hand it is a matter of collective historical constructions, organized sets of landscapes, and equipment that aim at the accomplishment of community social interactions. On the other hand, it is a matter of competitions among groups and the same sets of landscapes for conquering spaces in urban settings (Souza, 2000; Pedrão, 1993; Zajdznajder, 1979).

Since the very beginning, it has been within this contraction between cooperation and competition that urbanities have been building their fundamental roles of political debate and administrative and productive direction.

Urban settings became spaces for privileged forums of debates and social constructions. It is not difficult to demonstrate that the main debates on Science, Education, Hygiene and Health, as well as on Legal issues and

Law or on any other social aspect have always been held via debate forums and urban social practices. Not only official forums and formal government spaces are included here. It is necessary that we have Gramski's view on urban institutions and their role in social construction (Gramski, 1978). Thus, a hospital, a school, a bus station, are all centers of social interaction and political debate, not only those that are explicit but also, and especially, those resulting from the social interaction and daily use of urban equipment and landscape. Each attitude, each group or individual move, each choice, is an element of debate and socio-urban construction.

The city has remained almost absolute as a privileged stage of these debates and constructions of history until recently. The emergence of new information technologies, new communication media and techniques, and especially new technological environments of network interactions since the end of the 20th century, has fostered the appearance of alternative ways of social construction and debate, which are almost close to a conspiration capable of offering differently located communities supra-urban and supra-local social construction environments, yet influent in each location.

Urban debate, with rare and weak exceptions, has always been situated in the context of urbanity itself. What happens is that the interaction and coexistence capable of legitimating social constructions always take place in the community of immediate contact of each subject. The rare contacts through mail, telephone or telegraph, in travels, or even recently after television, are neither frequent, nor continuous, nor updated, nor do they have the possibility of continuous and daily multi-participation necessary for the involvement in debates and social constructions, properties which were only obtained in the context of urban quotidian. Network societies manage to produce these essential characteristics for network social construction, making a certain trans-urbanity possible, formed by communities composed by non-territorial or city identities, which allow debate and social constructions at other levels, not urban, and are capable of fostering the many current examples of politics and electronic government.

NETWORK COMMUNITIES

In the last 50 or maybe 60 years, humankind has witnessed the overwhelming growth of computer and information technologies. This growth, besides resulting in the insertion of these technologies in almost all human relations and actuation, has enabled an electronic network social environment to provoke some novelties as for the possibilities of social interaction and communal organization of human beings (Matta, 2001). Pierre

Levy very properly identifies the functioning of network society by calling it the knowledge society and working from the material basis prompted by the network environment (Levy, 1993, 1998).

Many experts state that people nowadays experience the emergence of a post-modern period. We do not really espouse this idea, for we believe that modernity is characterized by the hegemony of a capitalist society, of its specific mode of production, and of the set of ideas that support such a society. However, it is undeniable that some changes provoked by the new environment have split with the classical relationship and interaction patterns lived mainly in the urban community environment in order to reach new ways and dimensions, making possible new social constructions and even new productive relationships.

The Internet, worldwide popular thanks to an installed computer base, has made possible the construction of great series of communities that meet and work virtually. The Internet was created, since the beginning, with a communal vocation. Although the first community has been created for military purposes, the Internet quickly evolved to reach scientific, commercial, educational, entertainment and other communities (Negroponte, 1996; Canton, 2001). In fact, in very few years, millions of societies and communities, not virtual at all, were formed, yet meeting in the virtual environment.

It is important to notice that even though they meet virtually, not simultaneously and independently from their geographic position, these communities are real and not virtual, and their effects and influence are concrete. Therefore, a group of supra-urban and even supra-national communal organizations is created. It is evident that each learning community, or each praxis diverse community, or any other community that takes place "inside of" computer networks, is capable of aggregating participants who are apart even by continents or oceans, but who nevertheless manage to interact, exchange ideas, in an instantaneous way in real time, or asynchronously with time lapses, or discuss and make decisions, build something in common, as if they were at the same place.

This power has exceeded the classical capacity of interaction and debate formerly only exclusive of urbanity, provoking themes and discussions to take place in regional or worldwide community environments. In turn, discussions tend to return, under the influence of a wider network interaction, to the local context, translated then by the citizen of urbanity, who lives their local problems, but who now manages to take part in many trans-urban communities, gathering diverse views and realities, different from that in which he/she lives, to finally influence his/her local environment based on those new experiences.

It is important now to see some examples of those communities and the way they work, in order to perceive the complexity of what is happening in these social processes:

1. Even though Salvador has improved a lot its capacity of attending the material needs of its inhabitants, it's not difficult for a researcher or a student to keep distant or even on the border of the main scientific development on any theme, considering the fact that the local bookstores and Brazilian editorial politics are many times limited concerning novelties. In Salvador we have some difficulty, in our urban community context, in participating in a more advanced editorial context. Since digital bookstores such as Barnes and Nobles and Amazon started to manage international communities of customers and suppliers, it has been possible to participate and catch up comfortably and efficiently with any editorial development on any theme ("Amazon fr", n.d.; "Barnes &", n.d.). Praxis communities were then created aiming at the world editorial market that updates whoever is interested at any moment. Customers will be able to contact other customers or whoever is interested in topics related to their purchases in the world. The participation of lots of local citizens in this kind of community will naturally influence the place. Just like the virtual bookstore, other bookstores, Internet markets, are more and more common and creating conditions to the expansion of this kind of trans-urbanity.

2. The clubs and communities that gather people with common interests are not new and have always gathered people from diverse origins. Professional associations, fan clubs, group of friends, sports affectionate ones, members of parties or political groups, and other groups, have always had inter-urban and international action. Services, which are huge nowadays, of associations of people of all kinds, ethnics, creeds and interests, who interact, debate and build up inter-community and trans-urban realities in an uncontrollable and uncountable way, multiply. The Brazilian Web page *Grupos* for example, counts up to 35,000 groups that discuss several themes such as education, environment, news, publishing, religion, music, arts, sports, law and government, business, regions, countries, health, medicine, behavior, sexuality and many more ("Grupos.com.br, a", n.d.).

3. Political movements, common people organizations and NGOs are good examples of this trans-urbanity. There are many examples of organizations that work on the Internet. This is a very important point that is not noticed very consciously by non-specialists, since terrorist groups, the famous Al Quaeda, gangs and mafias can also roam and act through this new way. It is worth pointing out that this also happens in urban communities. In the process of competition for solutions found in cities, we can find the most diverse political groups, delinquents and controvertists, who are violent many times. Besides contradictory groups, we also find several examples of more acceptable activism, more participative, but always supra-urban, and continually transforming the local debates from the broader ongoing debate. Two good examples are the international NGO Green Peace and the MST ("Greenpeace", n.d.; "MAT-Movimento", n.d.).

4. Learning communities have also spread. Many are the solutions for distance education, DE as it is commonly known nowadays. However, in reality, the true learning communities are not that common. Lots of DE proposals are mere transpositions of the classical school to the network, in which a center starts to tell how it should be, while several receptors only receive a ready packet of what they call knowledge. Those initiatives are on the network, but they add nothing to the network environment. They are non-communitarian services because they don't accept participation. This fact is considered absurd, since education is the science that studies more deeply interactivity, interactions, and the possibility to cooperate and its consequences to the formation of citizenship and human beings. On the other hand, the existence of learning communities promotes the spreading of trans-urban communitarian society, since it enables people to socially interact beyond the local community and its concerns. Some examples of environments propitious to the formation of true learning communities deserve to be mentioned. We have remarkable cases like *Virtual University, Knowledge Forum* and *aulafácil*. They are all prepared systems for the articulation of communities which have the construction of knowledge and the network learning as goals ("Virtual U", n.d.; "Learning in motion", n.d.; "Aulafácil.com.br", n.d.).

5. The electronic government has been more and more effective. In the beginning it was just about strategic military problems and afterwards, an instrument of accomplishment of the most important governmental politics: the divulging of projects and reports, resources division, ministries politics and others. This was followed by the diffusion and performance of state, province and

even county governments. And finally each simpler service could be done in network. That is how, from elections, declaration and payment of taxes and terrorism combat or policing to counseling and health care are efficiently conducted by the government in a network. One clear example of the power of the government in a network is in the case of education and scientific research. At federal level, MEC, CAPES and CNPQ, through their Web pages, the LATTES system, the graduation courses Collection and Evaluation systems, the submission of new courses system, the diverse systems of schools evaluation, the systems of organization of proposals for resources raising, and others, have created the possibility of organization of a real education and research network in the country. Through the network these government institutes and departments have efficiently, in real and continuous time, and in a trans-urban way, organized the national politics of research, also reaching abroad and building debate bases that extrapolate any local base, in a definitive and inter-communitarian way. The state level has been trying to keep record of these federal results, having already had some successes such as the Web page of FAPESB and the page of the State Education Secretariat. The city of Salvador still has to create its version of a Network Education Municipal Secretariat. It is undeniable that in many of their services, governmental Web pages are already playing their fundamental role of trans-urban administration and official organization of the society in network ("CNPQ". n.d.; "CAPES". n.d.; "Educação" n.d.; "FAPESB" n.d.: "Secretaria da Educação", n.d.; "Salvador", n.d.), despite of the many possible criticisms, coming especially from the process of initial and experimental creation of these networks of electronic government.

The emergence of network communities exemplified here has not been thoroughly studied yet. For that reason this article is not about an exhaustive finding, nor about a conclusive study. Instead, we have here a preliminary study whose most important consequence is the divulging of a situation still preliminary and even embryonic, also calling it to the attention of the readers so that they participate in this construction.

CONCLUSION

The development of technologies might be the behavior that most differentiates the human being from the other forms of life that inhabit our planet. The city, in its turn,

has been the privileged stage of development of the technologies: social interaction, production, commerce and decisions center, since its origin, the urban centers have stood out as development centers of the most diverse technology, always focusing on making easier and easier everyday reality and the interaction of the citizens around the construction of their lives and social realities.

The so-called new technologies of computing and communication also result from the urban development of urbanities. The unusual fact is that these technologies have been used so that the urban interaction be extrapolated and result in propitious environments for the interurban or even trans-urban interaction, as we tried to show in this article.

The suggested trans-urbanity is due to the evidence that the new technologies not only make possible contacts and interurban constructions from the transport or communication among urban centers, but also create real organized and continuous networks of interaction, discussion and constructions of diverse interactivities that constantly exceed the local scope, create discussion and debate environments of quite longer reach, to return from its members in the form of influence to the places where they live.

In the future we might be able to better devise the equivalent to avenues, streets, viaducts or squares present in those virtual communities that inhabit the electronic media. This might happen as research in the area advances and as we are able to interpret more clearly the info ways, which virtually substitute the classical ways of flow and places of interaction and coexistence of the urban ways.

We can currently devise, with a certain clarity, that the human beings/inhabitants of the urbanities coexist and interact electronically in other substratum of trans-urban communities. They end up composing a complex set of influences, re-influences and consequences of their participations in all the substratum they inhabit, which sets ground for a renewal and plural construction movement at all levels, inclusive in the urban space.

Trans-urban ways, complex environment of inter-communitarian interactions, electronic media, and many other concepts, are only one part of what we have to figure out and better understand so that a useful knowledge can be built, better able to guide the human being in these new social interaction environments.

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KEY TERMS

Collaborative Environment: An environment for work and experience that is capable of supporting the construction of collective practices and knowledge.

Computer Network: A computer network is an association of linked computers capable of sharing processing resources, thus allowing users to work interactivly.

Network Communities: Are communities of praxis that are digitally connected through a computer network.

Network Society: A network society is one in which the members are connected by a computer network.

Trans-Urbanity: Trans-urbanity is the capacity of the world wide network of computers, and of the Internet, to support the proper practical relations of an urbanity, in environments that surpass a physical city and involve a set of varied urbanities, in accordance with the practice of the participants of the society in the net, who coexist in a digital way, but who also have a physical existence in the urban context which they inhabit. The urbanity then surpasses the local place, thus extending the concrete practice of the citizens beyond the immediate physical context.

Urbanity: A set of people, institutions and interdependent relations that exist collectively in a city, and all the individual or collective interests and existences that belong and constitute the city.

Urban Information Systems in Turkish Local Governments

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INTRODUCTION

Since the end of 1980s, different sectors have implemented geographical information systems (GIS) in Turkey. A study on GIS market in Turkey indicates that municipalities are the primary customers (Gülersoy & Yigiter, 1999). One of the earliest GIS projects in Turkey began with the production of digital maps covering the boundaries of Istanbul Metropolitan Municipality in 1987. Since 1994, a rapid development process has occurred with the widespread diffusion of GIS especially in universities and large public sector organizations respectively. However, the early city-wide municipal GIS projects were initiated only after 1996 (Ucuzal, 1999). In recent years, a major change has occurred in the context of GIS projects from small-scale infrastructure projects to city-wide municipal GIS projects for three reasons:

1. After the devastating earthquake in Marmara region in 1999, people suffered from the lack of vitally important information, because such information never existed or was never kept in a systematic way. The importance of accumulation and distribution of up-to-date and accurate data among city-wide organizations was recognized (Tecim, 2001);
2. Rapid development of Internet in Turkey in recent years encouraged the communication efforts within and among the organizations, and among people and organizations, and this triggered the need for inter-organizational GIS (Karas, 2001);
3. Initiatives supporting e-municipality and e-government, and transition from government to governance raised the importance of transparency, communication, and public accountability (Tüzün & Sezer, 2002). In this sense, the concept of "urban information system" (UIS) began to be popular in the context of local governments. At the time of publication, UIS was used as an umbrella term encapsulating all the efforts for an information system—whether GIS or LIS—or information technologies like the Internet within an integrated system that is supposed to be performed in municipal operations in order to support organizational rationality.

Although so-called urban information systems were being marketed by vendors as the panacea for all problems, the implementation of large-scale information systems generally ended up with failure because information systems (IS) require large changes in the organization's existing structure. In the Turkish case, no municipality has been able to complete establishing a city-wide urban information system so far. Ankara, Istanbul, and Bursa are the cities, where implementation processes are still underway (Celik, 2002). Therefore, there needs to be case studies to address implementation problems of UIS and to evaluate the reasons behind the failures.

In this article, the emphasis will be given upon organizational and political aspects of UIS implementation that is critical for the success and failure of such systems. For this purpose, the approach adopted rests on the assumption that "the success or failure of IS projects is dependent on the degree of mismatch between the conceptions of these systems and the organizational realities into which it is introduced" (Heeks, 1999). In the rest of the article, based on Heeks's argument, the assessment of these gaps is evidenced in the case of Turkish metropolitan municipalities, and further evaluations are made guiding further projects and studies.

ORGANIZATIONAL CONTEXT OF INFORMATION SYSTEMS

Information systems today play a vital role in businesses, governments, and other organizations. Because they are so closely tied to organizations, it is necessary to closely understand the nature of organizational realities. Public sector organizations like municipalities are the single largest collector, user, holder and producer of information. The work of these organizations is thus very information-intensive.

Municipalities are responsible for providing the basic urban services (i.e., infrastructure development, fire department operations, garbage collection, planning services, etc.) to the public that requires collecting accurate information about environment and efficient use of this data to perform municipal tasks. The capability for planning, programming and decision making in the municipali-

ties is largely dependent on the collecting, storing, preserving and managing of the spatial information. Municipalities collect and manage both spatial data (i.e., district plan, base maps and cadastre maps) and non-spatial data (i.e., water-system revenues, environmental taxation and building permissions) in their operations. Almost 80% of total data exploited by municipalities are "spatial data". Thanks to advancing technology municipalities are increasingly using geographic information systems (GIS), management information systems (MIS), and the Internet to carry out municipal tasks and services more efficiently. By combining many of the municipal services into an urban information system, the aim is to obtain service unity, reduce service costs and increase revenues.

Information systems differ from information technologies in that they involve people and their actions. Further, they incorporate a set of rational structures, processes and even culture and strategies for the operation (Campbell & McGrath, 2003). Thus, changes in the organizational context are required for information systems to operate rationally.

Considerable declines in the price of information technologies and the increased capacities of technological innovations in supporting municipal tasks and services have increased the implementation of urban information systems (UIS) in Turkish municipalities. Although considerable resources were allocated for UIS projects, a great many "implementation failures" are experienced due to the lack of required interest during the implementation process. Despite the promise of supporting the organizational rationality, the aim of many UIS projects is to get prestige. Municipalities tend to favor large, complex UIS projects supported by generous funding. But the continually changing political context brings an end to the projects started because of prestige, but not supported by organizational rationality.

In this context, Heeks's ITPOSMO model, based on conception-reality gap assessment, allows a suitable framework to reveal the mismatch between the concept of hard-rational design of information systems and soft political realities of organizations.

ITPOSMO DIMENSIONS OF INFORMATION SYSTEM

Richard Heeks's (1999) model of conception-reality gap assessment is an effective technique, which helps to illuminate the causes of an implementation outcome in organizations (Kouroubali, 2002). According to Heeks, there are conception-reality gaps in implementation process of urban information systems. Successful adoption depends on the size of these gaps: "the larger the gap, the greater the risk of failure" (Heeks, 1999, p. 59). After a

review of a number of case studies, he concludes that gaps between conceptions and reality can be classified into seven categories summarized by the I-T-P-O-S-M-O acronym:

- **Information:** Provided by the system versus actual information needs, and the extent to which the organization can access the information.
- **Technology:** Technological capacity required for participation and actual technology capacity of target organizations.
- **Process:** Technology features in relation to existing processes.
- **Objectives and values:** In accordance with the objectives and values incorporated in the system in relation to objectives and values of users.
- **Staffing and skills:** How well the system fits with human capability requirements.
- **Management and structures:** How well the system fits within existing organizational structures.
- **Other resources:** How available resources such as time and money match with required ones (Heeks, 2001).

Heeks's model of conception-reality gap based on ITPOSMO dimensions has a great value for the following case study section for three reasons:

1. Conception-reality gap assessment is derived from world-wide examples of IS implementations particularly from the public sector organizations and those of many developing countries;
2. ITPOSMO model has the value to being able to examine the reasons why the introduction of information system projects in similar organizational settings results in a various degrees of success or failure;
3. A knowledge base consisting of ITPOSMO dimensions creates opportunities to share and communicate the reasons of success and failure of different cases systematically.

Further clarifications on the pros and cons of the technique are discussed by Heeks elsewhere (Heeks, 2003).

BURSA URBAN INFORMATION SYSTEM (BUIS)

As mentioned in the previous section, efforts to implement Urban Information Systems (UIS) in Turkish municipalities are in infant stages so there is value in carefully documenting implementation process. The Bursa Urban

Information System (BUIS) was selected for study for three specific reasons:

1. the relatively longer experience of urban information systems (since 1996) in this situation creates a greater chance to observe changes through time based on ITPOSMO dimensions;
2. the availability of more financial resources, and municipality's ready acceptance of the wider implementation of various technological systems;
3. the funding obtained through an international donation-loan, professional consultancy and feasibility study provided a significant impetus for a detailed investigation.

Development of BUIS Project

With automotive and major textile plants, and foodstuff industry, Bursa is one of the prime industrial centers in Turkey. With its current population of 1.6 million, the city is the fifth largest in Turkey. In 1987, Bursa was granted the status of a "metropolitan municipality", encompassing three district municipalities under its jurisdiction.

Bursa Metropolitan Municipality wanted to use UIS for the planning and management of this rapidly flourishing city. With such a motivation, they began BUIS project with a GIS feasibility study conducted by U.S.-based firm "Psomas and Associates" between 1994-1996. Funding for the feasibility study was through "Trade and Development Agency" (TDA), an arm of the United States Department of State. The study had four major steps: needs assessment, study tour, pilot project and feasibility study/ implementation plan (Henstridge, 1999). Meanwhile, an international fund provided Bursa Metropolitan Municipality with a loan from the World Bank for the planning, reconstructing, improving and managing the water and sewerage system of the city. After the completion of feasibility study, Intergraph won the bidding to design and to begin implementing Phase-1 of the project in 1996. In order to provide an interactive system management, Intergraph established a branch in Bursa for the implementation process. Permanent staff members from the Metropolitan municipality and district municipalities of Bursa were assigned for the control of the implementation process from 1996 to 1998. Aside from Intergraph, three different companies that specialize in different categories of data collection and processing signed a contract within the same period. Since 1999, BUIS had been fully operated by local "urban information system division", which was responsible for operating the system, supporting other departments in the organization, and coordinating inter-organizational data sharing among respected local organizations.

ITPOSMO Dimensions of BUIS

Based on the results of field study, interviews, and corresponding materials, Richard Heeks's ITPOSMO model was examined for BUIS.

Information

As a rapidly urbanizing metropolitan region, Bursa is undergoing tremendous infrastructure expansion with associated land titling, land registration and environmental projects. In the implementation phase-1 (1996-1998), the information needs of BUIS were projected and four different firms were commissioned to produce spatial data (i.e., base maps, cadastre maps, etc.) and attribute data (i.e., building details, household data) through surveys and digitization of maps. Then, an inter-organizational network was established. Covering three metropolitan-district municipalities in Bursa, The Cadastre and Title Deed Office, Turkish Telecom, Bursa Natural Gas Company, the BUIS implementation succeeded in the coordination of data management (BUIS, 2003). It also provided a software application developed for 182 "muhtars" (selected headmen of the villages), connecting them to the main system by wide-area network.

The conception-reality gaps for were as follows:

1. there was an absolute need for accurate and up-to-date data in the heart of all information systems. There were some serious problems in the currency of the data that threatened the sustainability of the project: e.g., since the international funding options were not available after 1999 the heavy costs of information maintenance (46% of total BUIS expenditures) became more prone to the political choices of decision-makers;
2. there were serious inefficiencies in the provision of attribute data by respected local bodies: e.g., muhtars were expected to update the database once in a week. In reality, only 20% of them succeeded in operating properly (Erarslan, 1997); and
3. information systems require a clear information management strategy to fulfill the organizational needs and objectives rationally. Yet, the fact that the needs assessments could not be completed by each municipal unit, meant that features of the information systems largely fail to address to the needs and objectives of the organization.

Technology

The hardware and associated GIS software was provided in the implementation phase of the project with the

support of international donors. Both software and hardware are currently operational to perform municipal tasks and services. There is also a fiber-optic network connection between all municipal divisions and corresponding district municipalities.

The conception-reality gap was relatively low for the technology dimension but some issues still need to be improved. These include the coordination of municipal tasks and inter-organizational communication between local bodies, and better provision of municipal services which were the major aims of the BUIS. The telecommunications infrastructure in Turkey, however, is somewhat limited, therefore there some problems occurred in the provision of Web-based services. There was not a fully established network system in and between local public sector organizations and this made the sharing of data more challenging.

Processes

As proposed in the feasibility study, "Urban Information System Division" was founded under the Directorate of Public Works to support functioning of municipal services, in-house production and maintenance of information. Many municipal units adjusted their working processes according to BUIS. For example, citizens' demand for fixing and maintaining of infrastructure system via telephone service was converted into a "task sheet" by local system operator and transmitted to maintenance crews working in the field.

Conception-reality gap was also low for this dimension. Yet, the absence of office automation reduced the opportunity of fully integrated work process that BUIS may have offered.

Objectives and Values

The feasibility report assumed objectives of greater efficiency through increased revenue generated from property tax collection, effective provision of utility services, control of urban development, and delivery of emergency health, safety and police services with BUIS project.

Some of the system objectives mentioned earlier were achieved. On the other hand, there were some problems increasing the size of this gap:

1. an urban information system is a costly investment and may only be profitable in the long run. It requires a strong political and individual commitment to fulfill the objectives of the organization. In this respect, such factors as the international consultants, project contractors leaving at the end of the phase-1 of the project with the expiration of their contracts, international donors withdrawing their

support, and the mayor, the founder of the BUIS, not being re-elected, reduced the chance of wide spread adoption of the system;

2. In terms of values, there was a "communications gap" between politicians and BUIS administrators in the determination of current and future needs of BUIS.

Staffing and Skills

Feasibility study paid great attention to training of the staff for the successful system implementation. In this context, consultants provided a comprehensive training program included hardware, software, and training of system administrators, chief managers and system operators.

Staffing and skill gap was not important for the BUIS. Sufficient attention was given to continuous training of the staff in information technology. But innovative use of software packages and reinventing them for specific operations remained relatively small. This was largely because of the problem of public sector employment policy that neither computer skills nor individual productivity was encouraged and rewarded by the administrative system.

Management System and Structures

The design of BUIS proposed strategy to develop an appropriate structure aiming to increase the effectiveness of the organization and its service to its clients or public.

Since BUIS had a city-wide basis, some obstacles were encountered in the sharing and production of the data originating from the country's legal and administrative system:

1. the majority of applications in the GIS market were insufficient to fully perform the responsibilities and coordination role of Metropolitan Municipalities to the digital environment (BUIS, 2003);

2. there was an ongoing challenge between local bodies of central administration and Metropolitan Municipality in the sharing of information. As vital source of BUIS, for instance, cadastre maps were not available free of charge for Municipal organizations; and

3. there was also a conflict between Metropolitan Municipality and associated district municipalities in conjunction with their political stances. In some cases, district municipalities may establish completely different software packages or operating systems that interrupt the city-wide coordination efforts and cause economic loss due to the incom-

patible data production and exchange. BUIS suffers largely from these issues and the gap was higher for this dimension.

Other Resources

For the BUIS case, donor-aid made the money available for the feasibility studies and phase-1 of the project. The time schedule for training and implementation of basic features of the system worked for the first stage as envisaged in feasibility study. Also, some revenues were gained through the marketing of spatial data and digital maps prepared by the BUIS staff (BUIS, 2003).

But significant budget cut-offs were experienced in the second phase due to the lack of political support and wider economic recession in the country. Therefore, the conception-reality gap was gradually increased.

CONCLUSION

The result of the study indicates that several ITPOSMO dimensions namely "information", "objectives and values", and "management structures and systems" seem critical and may lead to "sustainability failure" for BUIS. Broadly, 15 years of GIS experience in Turkish Municipalities confirms that urban information system (UIS) implementation was neither based on a well-designed information management strategy nor utilized in long-run due to the ever-changing political context. A UIS generally incorporates a significant set of rational structures, process, culture, professional strategies and involvement. For this reason, almost all of the implementations realized that failure to complete the pre-requisite conditions and careful management of implementation process may face failure (Pick, 2004).

There is no recipe for success that might be advised to other institutions. But, freezing some ITPOSMO dimensions, getting them smaller and simpler and finding solutions by bringing them closer to organizational realities may open the way leading to a more successful implementation (Heeks, 1999). In this sense, the approach of incrementalism can be applied to avoid over-ambitious UIS projects, which carry high risks of failure. This approach recommends organizations to concentrate on limited applications, which directly meet perceived organizational needs. Such an approach is less vulnerable to organizational and environmental changes and political instability which are very important in developing country context.

Studies in GIS implementation problems especially in developing countries should become a priority issue (Ramasubramanian, 1999). Yet, currently few studies focusing on the institutional dimension of the technology

are demonstrated in recorded case studies. In the research pyramid of GIS studies (Obermeyer & Pinto, 1994), institutional issues should be given more attention. As a result, the evidence obtained from Heeks's ITPOSMO model could be suitably extended and updated. This study will hopefully lead to further studies which address the soft organizational realities (cultural, structural, political, people factors) of urban information systems.

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KEY TERMS

Communications Gap: Relates to that part of the knowledge gap which can be attributed to miscommunications between the parties involved (i.e., IT designers understand technology but not the realities of governance. Officials and politicians understand the realities of governance but not the technology).

Geographic Information System (GIS): A GIS is a computerized system for the collection, storage, manipulation, and output of information that is spatially referenced (Obermeyer & Pinto, 1994).

Land Information System (LIS): A GIS specially designed for use with land information. Land rights, ownership, boundaries, utility, land cover, and zoning data are common layers and attributes in a LIS.

Non-Spatial (attribute) Data: Data that relate to a specific, precisely defined location. The data are often statistical but may be text, images or multi-media. These are linked in the GIS to spatial data that define the location.

Spatial Data: Any information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology.

Sustainability Failure: An initiative that succeeds initially but then fails after a year or so.

Wide-Area Network (WAN): A computer network that spans a relatively large geographical area. Typically, a WAN consists of two or more Local-Area Networks (LANs). Computers connected to a WAN are often connected through public networks, such as the telephone system. They can also be connected through leased lines or satellites.

Using Virtual Mobility to Alleviate Aspects of Social Exclusion

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INTRODUCTION

People's ability to participate in the activities that are necessary to ensure their economic, political and social participation in the society in which they live is dependent upon the accessibility of the activities. Accessibility has traditionally been perceived as a function of the space, or distance, between the origin of the individual (or community) and the destination of the activity—the opportunity, service, social network, goods—alongside the time that it takes to cross this space. Thus, accessibility is dependent upon the individual's ability to overcome space and time barriers, allowing them to reach the right place or person, at the right time—and, of course, upon the availability to them of adequate resources to do this (Couclelis, 2000)[1].

Transportation has traditionally been the principal technology, or resource, employed to fill this accessibility function, enabling people to travel faster and thus further to access a wider range of activities – for example, educational and employment opportunities, healthcare services, family and friends, healthy, or cheaper, foodstuffs and so forth. When individuals lack the transportation resources to overcome these spatial and temporal separations, however, these activities become inaccessible. The inability to overcome the separation between individuals or the communities in which they live and the opportunities, services, social networks and other goods that they seek to reach is a significant factor in both enforcing and reinforcing social exclusion.

Improvements in accessibility have, historically, been associated with advances in transportation technology, or in enhanced popular access to transport. Efforts to overcome accessibility barriers—and to challenge mobility-related social exclusion—have thus centred around improving access to physical mobility amongst socially excluded individuals and communities. In 2003, the UK government published *Making the Connections* (SEU, 2003), the result of a two-year study into the role of a lack of adequate transport in the experience of social exclusion. The principal recommendation given in the document to the communities and regions that were seeking to reduce social exclusion and induce development was to increase access to transportation, to increase mobility and, therefore, accessibility.

However, the advent of ICT presents a viable alternative to physical mobility in providing accessibility, allowing communication, information retrieval and goods exchange without the need for co-presence or physical movement by the person undertaking the activity. In overcoming many space/time accessibility constraints, ICT have the potential to reshape patterns of mobility and mobility-related exclusion. Indeed, evidence suggests not only that the use of ICT, specifically, the Internet is replacing existing travel and substituting for existing mobility, but also that it is providing an additional means of access to activities from which people were previously excluded, because of their accessibility deficit (Kenyon et al., 2003).

This article considers the role of inadequate physical accessibility in social exclusion, with a focus upon the role of mobility in both development and disadvantage at the individual and community levels. The article begins by providing a brief overview of the concept of social exclusion, before turning to highlight the place of mobility in exclusion. The article defines virtual mobility, then discusses the role of ICT, specifically, the Internet, in overcoming space/time barriers to participation, without recourse to physical mobility. The article suggests practical examples where Internet use can, not only replace the need to travel to access the opportunity, service, social network or other goods, but also provide a new means of access to activities from which individuals or communities were previously excluded. While recognising the limitations of this form of access, in terms of the possible negative social and transport effects of virtual mobility, the article is enthusiastic about the potential of the Internet to play a strong role in the delivery of social policy and the development of communities.

The article focuses upon community development in the United Kingdom (UK), in the context of initiatives to reduce social exclusion in deprived communities and regions. However, the author suggests that the debate presented is applicable across many countries, and that the lessons learned are applicable across developmental contexts.

SOCIAL EXCLUSION

Social exclusion is a central concept in social policy in the UK. The majority of the government's social policy initiatives in 2004 aim to eradicate the presence of this social ill, overseen by the Social Exclusion Unit, a body established in 1997 both to develop clearer understanding of and to ensure targeted responses to, social exclusion. It is a relatively recent concept, developed following the detailed analysis of the different types of inequality in modern society during the latter part of the 20th century. Social scientists had begun to recognise that inequality and disadvantage are not always material in origin, or in consequence. That is, that they are not always caused by income poverty, nor is income poverty their sole manifestation. Rather, there are many different causes, consequences and experiences of inequality and disadvantage. Therefore, policy initiatives to tackle the causes and consequences of poverty alone are unlikely to be successful in tackling inequality and disadvantage when understood in their multi-dimensional forms.

The term "social exclusion" was coined to overcome the limitations of the poverty discourse. The term embodies the sense that social exclusion is an active process—the process of being excluded from, or shut out of, full participation in society. It is the process of the interplay between a number of factors, unique to the individual or group, the consequence of which is a denial of access to the opportunity to participate in the cultural, economic, political and social life of the community. This process results not only in a diminished material and non-material quality of life, but also in tempered life chances, choices and a reduced level of citizenship (for a full overview of the poverty/social exclusion literature, see Kenyon et al., 2002).

Table 1, taken from Kenyon (2003), develops a framework of understanding for the concept, highlighting nine dimensions of exclusion. Within these dimensions, there are a number of factors which, when experienced either on their own or in combination with other factors, from any of the dimensions, can contribute toward the feeling of exclusion.

THE ROLE OF MOBILITY IN EXCLUSION

Table 1 highlights a *mobility* dimension to exclusion. The focus of this dimension is upon the accessibility deficit that arises when people or communities have inadequate access to public or private transportation.

As highlighted in the introduction to this article, access to opportunities, services, social networks and other goods is dependent upon the ability to traverse the spatial and temporal barriers between the origin of the individual and the destination at which the desirable or necessary activity is located. In the UK, in common with many nations across the globe, the spatial and temporal separations between activities have increased both be-

Table 1. Understanding social exclusion

Dimension	Discussion	Potential exclusionary factors (not exhaustive)
Economic	Factors affecting and arising from access to money	Income poverty; unemployment; lack of access to credit facilities
Living space	Factors in the local environment, which may disadvantage the individual or group	Crime; safety; ecological environment (pollution, availability of green space); availability of services and facilities; disunity of community
Mobility	Factors affecting and arising from access to (motorised) transport	Inadequate access to private transport; inadequate public transport services; poor access to opportunities, services, social networks and other goods
Personal	Individual characteristics influencing position in society and attitudes towards the self	Class; culture; disability; ethnicity; gender; skills
Personal political	The ability to make decisions over one's own life	Powerlessness; disempowerment; restricted choices; lack of access to information
Organised political	The ability to influence decision making at an organised level	Denial of rights/freedoms; disenfranchisement; low participation in interest groups; lack of representation; lack of access to information
Social networks	Factors arising from access to and relations with other people	Isolation; loneliness
Societal	Social factors at a societal level	Crime; education levels; family dynamics; health and social care; inequality
Temporal	Factors causing and arising from time pressures	Insufficient time to participate in social, political, economic activities

cause of and as a consequence of increasing car ownership, land use patterns have developed to clearly demarcate geographical areas in terms of activity-type. Areas for home, work, education, shopping and leisure have grown steadily further apart. As a result, mobility has become a necessary tool to overcome these space/time barriers and to enable participation in society, evidenced by ever-increasing average journey lengths, numbers of journeys and journey complexity (DfT, 2002). Where there is inadequate access to adequate[2] transportation—adequate both in terms of traversing space and in doing so in a timely fashion—activities become inaccessible.

Table 2 illustrates the reduced accessibility that occurs as a result of the interaction between inadequate access to transport and the potential exclusionary factors within each dimension, highlighting the role that a lack of transport can play in each dimension of social exclusion. Lack of adequate mobility is shown to have a dual impact: firstly, actively enforcing social exclusion, where exclusion is seen to be a direct result of lack of mobility; and secondly, reinforcing exclusion, where lack of mobility can exacerbate existing experiences of exclusion. This second impact emphasises the disproportionate impact of "mobility-related exclusion" (Kenyon et al., 2002) upon both people and communities who are at risk of, or who currently experience, social exclusion, including people who live in rural areas, residents of urban "sink" estates, older people, people with disabilities, people who are unemployed and those on low incomes (SEU, 1998).

In addition to influencing the economic and social conditions in which social policy is constructed, as detailed in Table 2, mobility-related exclusion directly affects the ability of governments to implement social policies designed to alleviate social exclusion, alongside the ability of citizens to access social services and welfare. For example, access to information about employment opportunities, to interview and to sites of employment are highly mobility dependent, as is access to educational services and to health services, at all levels of health care provision. Currently in the UK, despite recent efforts to deliver benefit payments directly to the bank or post office, the ability to access benefits is highly dependent upon mobility. Finally, access to welfare support and administration offices, for example, housing offices and offices for social support, are dependent upon the physical movement of the individual seeking assistance between their home and the administrative office or support worker.

VIRTUAL MOBILITY

In *Making the Connections* (SEU, 2003), a number of mobility-based measures are suggested as solutions to the accessibility deficit, described in the previous section[3]. These include: the low-cost provision of access to cars, mopeds, driver training and insurance; and improvement in public transport services, for example, in

Table 2. The influence of inadequate mobility upon social exclusion[6]

Dimension of exclusion	Influence of lack of mobility: examples
1. Economic	Unemployment – inability to take a job because of lack of adequate transport to interview and to place of employment. 38% of jobseekers say that lack of transport is a barrier to employment; 12% say that lack of transport has stopped them from attending interview.
2. Living space	Geographical isolation and low level of service provision locally – lack of mobility reinforcing isolation and difficulty accessing key services. Every year, 1.4m people miss out on medical help because of transport difficulties.
3. Mobility	The cost, routing, timing, accessibility of public transport and the cost and accessibility of private transport acting as inhibitors to access to opportunities, services, social networks and other goods.
4. Personal	Not directly linked to mobility – factors including ethnicity, culture, gender.
5. Personal political	Personal disempowerment – linked to low levels of knowledge/poor access to information and support networks.
6. Organised political	Low participation – linked to inability to travel to meetings, which are often in the evenings in centralised locations.
7. Social networks	Loneliness and isolation – lack of adequate transport to visit family and friends, or to meet new friends. 18% of non-car owners find it difficult to see family and friends because of transport problems; as do 8% of those with access to a car.
8. Societal	Poor educational opportunities – inability to travel to learning venues. A problem for young and old potential learners. 6% of students have missed college because they cannot afford the transport; 6% 16-24 year olds have rejected FE because of transport costs.
9. Temporal	Time poverty – time taken to travel reduces time for activities, a problem for private and public transport users alike.

terms of accessibility, fares and routes. But could the accessibility needs of those who currently find access to opportunities, services, social networks and other goods problematic, because of limitations to physical mobility, be fulfilled, despite their lack of access to physical travel, via "virtual mobility"?

"Virtual mobility" is a shorthand term for the process of accessing activities that traditionally require physical mobility, but which can now be undertaken without recourse to physical travel by the individual undertaking the activity. While virtual mobility, understood as communication and information/goods exchange without the need for co-presence, has been around for many years, in the form of one-to-many media such as the printed word, radio and television, or one-to-one communications via telephone, telegraph, fax or postal mail, recent developments in and widespread adoption of ICT have created viable, quality opportunities for non-mobile access to activities. ICT can overcome space and time barriers to participation in activities, creating accessibility opportunities, both substituting for physical mobility and enabling access where previously there was an accessibility deficit.

The remainder of this article examines ways in which virtual mobility can be used to overcome social exclusion, based upon literature review, survey of Web sites and primary research conducted by the author[4]. However,

virtual mobility may also have negative mobility and/or social effects, which could cancel out these hypothesised benefits. Thus, the article then turns to draw caveats regarding the limitations of virtual mobility. The discussion refers specifically to virtual mobility via the Internet.

ACCESSIBLE ACTIVITIES: THE ROLE OF VIRTUAL MOBILITY

Table 3 shows how virtual mobility could be used to combat each dimension of social exclusion. The discussion selects six dimensions, to highlight ways in which virtual mobility can be—and, in many cases, is being—used to provide non-mobile access opportunities, services, social networks and other goods. The examples provided are indicative, not exhaustive. The URLs for referenced Web sites are given in Table 3[5].

Economic

The lack of access to both formal and informal information about job opportunities is a significant barrier to employment and can be influenced by lack of mobility (Shen, 2000). The provision of access to information online could enable the search for employment. In the UK, all jobs

Table 3. Using virtual mobility to overcome social exclusion

Dimension of exclusion	Influence of virtual mobility: example	Example Web sites (where applicable)
1. Economic	Employment: job vacancies posted; job applications; employment advice and training. Credit: alternative forms of credit and exchange.	jobcentreplus.gov.uk, manpower.co.uk, letslinkuk.org, ebay.com
2. Living space	Overcome lack of local services: education; healthcare information and advice; shopping.	learndirect.org.uk, nhsdirect.nhs.uk, ovacome.org.uk, tesco.com
3. Mobility	Overcoming accessibility deficit resulting from constraints upon mobility through use of the Internet.	-
4. Personal	Overcoming personal limitations: new opportunities for participation; support groups.	rnib.org.uk, gayyouthuk.co.uk
5. Personal political	Empowerment through access to information: single issue support groups; legal information.	prisonersfamilies.org.uk, adviceguide.org.uk, justask.org.uk
6. Organised political	Enhanced democratic participation: political parties; pressure groups; government consultations; contact political representatives; campaign information and support; online voting; online form filling.	labour.org.uk, foe.org.uk, sheffield.gov.uk, faxyourmp.com, inlandrevenue.gov.uk
7. Social networks	Contacting family and friends online: virtual communities of interest; geographically based networked communities; chat rooms/IM; support groups.	well.org, redbricks.org.uk, ubooty.co.uk, ukchat.com
8. Societal	Enhancing the community: community policing; local environmental action; community building.	neighbourhoodwatch.net, bbc.co.uk/crime, ebvonline.org
9. Temporal	Saved travel time: more time for participation in activities.	-

advertised by the employment service are posted online, eliminating the need to travel to the job centre to learn about job opportunities, a strategy emulated by private employment agencies and employers. Such agencies also offer careers and training guidance. Job seekers can download application forms and apply for jobs online, and people can post their curriculum vitae on dedicated Web sites. In addition to this formal function, Hanson (2000) discusses the role of informal networks in employment: "... studies of labor [sic] market processes repeatedly find that the information that flows through social networks and everyday personal interactions plays a pivotal role in shaping people's access to jobs, affecting type of work (occupation, industry), location, and compensation". These social networks can be fostered online, providing the contact with employed people that people in neighbourhoods with a high incidence of unemployment may lack.

Alternative forms of credit can be accessed online, for example, community credit unions (Kenyon et al., 2003; Little et al., 2000) and local exchange and trading schemes (Carter & Grieco, nd), where individuals can use their skills as credit, to "buy" the skills, goods or co-operation of other members of the community. The Internet also provides a boost to the informal economy, allowing individuals to access markets, more easily trading goods and services, through local or national auction portals.

Living Space

Low availability of accessible services is a significant factor in reinforcing social exclusion, not only in rural areas where population is sparse and demand low, but also within urban estates with high, but deprived, populations, where services have "drained away" as a result of fear of crime, or low perceived demand. While the Internet cannot substitute for facilities such as a leisure centre, school or hospital, it can provide proxy access to some services. For example, while prescription following online diagnosis is not yet legal in the UK (Future Health Bulletin, 2002; Midgeley, 2002), individuals can access formal healthcare information and advice online, for example, using NHS Direct. Much more could be done to utilise this medium in the provision of healthcare, for example, online conferences between patients and healthcare professionals, either via email or webcam – the latter already undertaken between healthcare professionals (Stanberry, 2002). Informal healthcare support is given in online support groups and information centres, set up and populated by sufferers, supporters and professionals.

The Internet could be seen as the world's biggest library, providing access to information and resources without the need for the mobility, skills or confidence to access a library. Similarly, formal education is available online, circumventing the need to travel to or attend a formal learning environment, which can be intimidating, off putting and ineffective for people for whom the education system has failed. And of course, it is the world's biggest shopping mall, allowing access to healthy foodstuffs where none are available locally—and to almost any other commodity.

Personal Political

Hanson (2000) discusses the central role of information in individual empowerment. Through the information and support forums online, individuals can be empowered, for example medically, vis-à-vis medical professionals, or social workers (Burrows et al., 2000), or perhaps legally, vis-à-vis employers or landlords, or socially, vis-à-vis social or work acquaintances. The stigma of accessing social support (Mickelson, 1997) can be overcome online, as people access information to enable self-help, or anonymously ask for support and assistance.

Organised Political

Participation in organised politics—in parties, pressure groups and local/national government—can require resources including mobility, time, money and "cultural capital"—most commonly, education, confidence and contacts (Ward, 1986). The increased opportunity for participation in democracy and the exercise of authority as a result of the removal of the physical mobility barrier was postulated by Day and Harris (1997) and Jones (1995) in the early years of the Internet and it has since been observed. Through virtual mobility, people can be given a voice and can express their views, gain information, participate in debate and place pressure on those in power, without the need for physical attendance at official council or party/pressure group meetings. In assisting access to information and officials, to each other and to sources of support, individuals and communities can become politically empowered, for example, Mele (1999) details the fight by residents to gain control of the redevelopment of their housing estate, as virtual mobility gave access to decision makers, sympathisers, information and each other. Shearman (1999) suggests that this could "change the power relationship between citizen and state", changing the opportunities to express opinions, giving access to both like- and opposite-minded people and allowing people to express their views in ways in which they could be more confident.

Social Networks

It is in this dimension that the accessibility function of virtual mobility can most clearly be seen—indeed, the role of the Internet in providing increased access to social networks has been implicit in all dimensions thus far, providing access to social support and companionship from both new and existing family and friends. Many commentators suggest that online activity boosts social contact, reducing exclusion. In addition to individuals' ability to participate in activities without recourse to physical mobility, online activity can develop community, both online, as geographically dispersed communities of interest (for example, Hampton, 2002; Rheingold, 2000; Wellman, 1999) and offline, where community intranets have reinvigorated the local community (including Hampton, 2003; Hampton & Wellman, 2003).

Societal

There is a strong hypothetical role for virtual mobility in supporting the welfare state. A number of commentators have examined the potential role of the Internet in administering health, social care and social support, concluding that the Internet could play a role in providing access to services, including healthcare, education and democratic participation (for example, Burrows et al., 2000; Muncer et al., 2000). Carter and Grieco (Nd) also postulate the possibility of community policing online, allowing community members to inform about crime without travelling to the police station and with reduced fear of reprisal. Indeed, the present UK government places high value on access to ICT as a fundamental aspect of citizenship in modern times, with the Internet at the centre of plans to improve the quality and accessibility of public services and a pledge to ensure that all citizens are able to access public Internet facilities by 2005 (Hudson, 2003; Selwyn, 2002) and all schools have broadband access by 2006 (E-envoy, 2002). Thus, virtual mobility may be able to play a role in the delivery of social policy and the reduction of social exclusion, without increasing and possibly even reducing the mobility burden.

LIMITATIONS OF VIRTUAL MOBILITY

The earlier discussion suggests a strong role for ICT, specifically, the Internet, in overcoming space-time barriers to accessibility and providing a strong supporting role in efforts to alleviate social exclusion, across many dimensions. However, important caveats should be drawn. The first concerns differential access to the Internet. People who are offline and unable to take advantage of Internet accessibility tend to be both individuals and communities who are traditionally vulnerable to both exclusion and mobility-related exclusion—older people, financially poor, with low education/skills, little peer exposure to technology and, increasingly, living in rural areas (see for example, Graham, 2002; OII, 2003; ONS, 2003). If there is differential usage of virtual means of access by some sectors of the population, exclusion could increase—a virtual mobility-related dimension to social exclusion could occur. Initiatives to extend access beyond that naturally derived through market mechanisms, in the UK, for example, through UKOnline centres, have been shown to help ensure that the accessibility benefits discussed earlier are experienced throughout society.

Secondly, some commentators have raised concern about the decline in human relations as a result of participation in online activities – the loss of conversational skills, decline in face-to-face and physical contact, increased social isolation and the loss of community. Others discuss concern about deception and misrepresentation. And finally, the transport impacts of virtual mobility are unknown. Opinion is divided regarding the likelihood that virtual mobility will decrease, or increase, total mobility (key debates are outlined in Black, 2001; Mokhtarian & Salomon, 2002). If mobility is to increase, as a result of increased spatial horizons and the increased free time in which to travel, both resulting from Internet use, space-time barriers to accessibility are likely to be reinforced in some areas of life, for some people. This must be monitored and addressed if the accessibility benefits of virtual mobility are to be fully realised.

CONCLUSION

This article has sought to highlight the possible role for virtual mobility in overcoming mobility-related social exclusion. Highlighting the deficit in access which emerges when people have inadequate mobility, the article has discussed a need for an accessibility tool that is not reliant upon physical mobility. The ways in which virtual mobility could be used as a tool of social policy have been illustrated within each of the nine theorised dimensions of social exclusion and practical examples of the use of virtual mobility within social policy are given. However, important caveats are also drawn, regarding the need both to be aware of and to minimise the possible negative macro-level effects of virtual mobility.

Despite the possible limitations of virtual mobility, hypothesised in an earlier section, the author believes that the Internet could provide a powerful tool in the fight against social exclusion. It could and, indeed, is being

used to, enable access to opportunities, services, social networks and other goods, alleviating aspects of social exclusion for individuals and the communities in which they live.

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KEY TERMS

Accessibility: The sum of the space and time between an individual and an activity.

Activity: Within this article, "activity" is used as shorthand to refer to opportunities, services, social networks and other goods, as well as to people, communities and other locations.

ICT: Information and Communications Technology/ies.

Mobility-Related Exclusion: Aspects of social exclusion which derive from lack of physical access.

Social Exclusion: A shorthand term for the complex process of exclusion from the cultural, economic, political and social life of the community in which one lives.

Social Policy: The policies which governments use for welfare and social protection.

Virtual Mobility: The use of the Internet to access activities without recourse to physical mobility by the person undertaking the activity.

ENDNOTES

[1]   In this article, "activity" is used as shorthand to refer to opportunities, services, social networks and other goods, as well as to people, communities and other locations.

[2]   DETR (2000) defines adequate transport as being affordable, available, accessible and acceptable. Here, adequacy incorporates this definition, yet is also interpreted as transport that provides mobility that can give access to the right place, at the right time, and within a reasonable amount of time.

[3]   The reader is advised that report's recommendations are not limited to the improvements in access to private and public transport detailed in this article and include long-term measures, such as changes in land use planning, to reduce space-time separations between activities. However, virtual mobility solutions are not included. A fuller critique of the report, which is outside the scope of the article, is provided in Kenyon (2003).

[4]   Research was undertaken within two projects upon which the author was principal researcher, both funded via the Future Integrated Transport programme, which is funded by the Engineering and Physical Sciences Research Council and the Department for Transport. In both studies, the principal investigator is Professor Glenn Lyons. Details are available at http://www.transport.uwe.ac.uk.

[5]   The reader should note that for brevity, the prefix 'http://www.' has been removed from the URLs.

[6]   All statistics are taken from SEU (2003). Please see main body text for fuller detail. Statistics and examples included are indicative, not exhaustive.

Voice Over IP for Rural Telecommunication Provision

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INTRODUCTION

With the continual convergence of analogue technologies with those either simulated or implemented in digital based equivalents, future benefits usually involve better reliability and lower costs. As current technical limitations are removed, the literature does not show any large scale assessment of the legal and security implications of the removal of cables in this digital world or the effect of a move toward wireless transmission in this context. Neither Voice Over Internet Protocol (VoIP) nor IEEE 802.11b is new technology, but the combination of these services to provide a primary telephone network for small regional centres is an innovative solution to rural telecommunication problems.

There are many companies, especially in the context in rural Australia, currently developing satellite communication networks for regional communities to access broadband equivalent internet access, generally where this type of bandwidth is usually unavailable. Reasons for insufficient access primarily are due to lack of infrastructure and this can be directly attributed to either the remoteness, or to the effect of a low level of population some areas which generally equates to the lack of potential return on investment for telecommunication companies wishing to establish infrastructure out to these regions.

The cost of implementing a traditional wired infrastructure to reach these lowly populated regions offers no great reward to the companies providing the service and therefore they usually discount such an expansion or explore other means to provide the minimum service required by the Australian legislation to every household.

Australia's primary telecommunications company, Telstra, who has a majority owner in the Australian government, is required to meet service supply standards to all Australian households—no matter the geographical location. Service levels to regional and remote regions of Australia are similar in quality to that of highly populated metropolitan areas but traditionally limited in the services they are required to provide. While current telephone coverage is of an acceptable level, the growth of internet access, among other forecasted future technologies requiring data like infrstructure (IP), has caused great bottlenecks within current solutions and network providers such as Telstra are exploring ways to overcome this. Simply stated, the infrastructure available was implemented with limited foresight and will not scale to accommodate these new and emerging services.

Satellite usage, among other networking technologies, is now being tested and implemented to allow for the delivery of large volumes of IP traffic to regions which are not covered within the major telecommunications network infrastructure. Most of these technologies being explored take the form of wireless. Included benefits of wireless such as the substantial cost reduction achieved with the avoidance of installing long distances of cable and infrastructure. Satellite, particularly with the use of KA band services, allows for clients to connect in a bidirectional fashion with very small aperture terminals (VSAT), transmitting via satellite hub locations to apertures in similar trip times to that of wired infrastructure.

The principle of satellite, and other technologies, is packet switched based usually on the underlying infrastructure of digital transfer as compared to analogue transfer used within the current circuit switched networks. While this provides significant increases in the amount and types of traffic which can be transferred simultaneously, it requires the translation of current analogue technologies, such as telephone and fax, to digital equivalence and back again to analogue to simulate current models. As with most of the services proposed to be offered, and in VoIP in particular, the timing and delivery model are of the upmost importance to ensure the quality of service for all users. Substantial fluctuations in the time for the delivery of digital packets can confuse the protocols and participants, making the phone call seem unnatural in comparison to current phone usage.

VoIP, as a standard, attempts to simulate the current analogue telephone call but utilises the advantages of digital networks with its ability to generate, route and receive phone calls. Of major concern is the efficiency of the network, along with quality of service (QoS), integra-

tion with plain old telephone systems (POTS) and last mile connections. Small companies hope to address some of these issues by offering clients access to metropolitan like services in regional Australia using the benefits of wireless communications not only for the major distance (satellite) but also at the last mile with wireless local loops in the form of 802.11b to connect to this service.

WHAT IS VoIP (VOICE OVER INTERNET PROTOCOL)?

This suggests traditional telephony, which is a circuit-switched technology, can be adapted or interact with an IP network (Marjalaakso, 2003). One may pose the question of why the traditional phone systems must be updated or complemented while it appears to be satisfying current requirements?

BENEFITS OF VoIP

Not only are the merging of voice and data traffic down an individual stream financially beneficial to users, but possible services provided are greatly increased with the ability for scalable updates over time, a characteristic not associated with the traditional analogue telephone network.

Financial Benefit

McPherson reports the financial benefits alone are not enough to entice a large scale of take up of VoIP (McPherson, 2003). Although it is known the cost of a packet switched network for VoIP is approximately half the cost than that of a circuit switched network, an end user will not be aware of these costs other than the monthly subscriber bill. Thus, the financial benefit will be the greatest selling point of the technology to customers and it must be highlighted and marketed openly.

How these vast financial benefits are achieved is due to the architecture of IP networks, and the ability for intelligent navigation (routing) to occur. This gives the appearance that the VoIP solution determines the cheapest method to place the call, when in fact it is predetermined by routing tables within the network. The private network is intelligent and directs the phone call to enter the PSTN where a local call charge will be incurred rather than that of a long distance call. The financial benefit is appealing but IP networks are not always reliable—particularly with time sensitive information.

Other benefits can include no external bills generated by internal calls, even if geographically separated. If a phone call is routed the entire distance via the IP network and never enters the PSTN, no third party bill will charge for that call, as compared to a leased line solution. An example of this is a company with many offices interconnected via broadband links into the internet using VPN connections to secure communications.

Service Benefit

The integration of two networks into one provides maintenance benefits, but is the convergence of voice and data a good relationship? Marjalaakso (2003) predicts the VoIP will compliment the already existing Internet based services such as web, email and newer technologies like net meeting and instant messaging.

SECURITY VULNERABILITIES OF VoIP

As with all technologies it is essential to examine whether customers confidentiality, integrity and availability to their conversations, data and service are preserved. Marjalaakso (2003) discusses the inbuilt security of standards such as SIP, but summarises that these are not valid as they are flawed and knowledge is widespread about such vulnerabilities. While this is true and valid, the level of encryption and secrecy on telephone services for domestic users and the current level of secrecy on circuit based networks must be determined.

Other risks associated with VoIP implementations are categorised below, using the traditional security goals of confidentiality, integrity and availability.

Confidentiality

Confidentiality concerns one's ability to remain anonymous to outsiders while being able to disclose information for authorisation and billing. Issues in confidentiality include eaves dropping and tapped. The Australian Telecommunications Act allows for a call entering a public network to be "tapped". In 2001-2002, 2,500 authorised phone tapping warrants were issued to authorities, with prosecutions from the information gathered from authorised tapping rising 48% proving this to be a valuable weapon for law enforcement. Thus it is an essential requirement for VoIP to be able to provide a similar or better attribute than current networks.

While current telephone networks offer no encryption on transport it is an attribute that is required for VoIP as it merges into accessible networks and makes the task of

unauthorised access much easier with the use of freely available tools such as traffic sniffers etc (Marjalaakso, 2003).

Integrity

Integrity is essential in a communication technology and by its very nature it is difficult to actually modify traffic in real time with VoIP as delay will cease the call. The integrity of the telephone call is rarely ever jeopardised when operating in real time. The public will need reassurance of this, along with their other fears of VoIP, when it comes VoIP is implemented in rural communities.

Authentication is important for receiving correct calls but also for network protection. It must be determined whether existing authentication techniques are going to be adopted for network access or if VoIP-specific means are to be implemented. Typically authentication within an internal network is not applied, but for gateway passthrough this generally requires an authentication of some type. Other issues of authentication relate back to the Telecommunications Act and its requirements in regards to call logging, tracing and tapping. By using strong authentication techniques, identification of unique persons is available during the authorisation stage.

Billing is one of the core features in a public network and must be reliable, accurate and non repudiable to ensure financial recovery of cost. Analogue telephony has suffered from phreaking and avoiding tolls to make calls and billing procedures disputable; VoIP must address these as high priorities when working in an external network. Different methods of billing can be implemented by service providers and authentication servers such as RADIUS or IAS (Microsoft's RADIUS equivalent product) can be used with appropriate software to enforce these plans.

With the experience from traditional telephony the practice of removing all service commands out of the user's accessible band can minimise the threat of phreaking. Traditionally the practice of playing various tones through a handset can override the accounting and billing mechanisms (Mitnick & Simon, 2001).

Call logging is a requirement of the Australian Telecommunication Act. While this is not so important within internal networks, it is a feature usually undertaken by VoIP hardware such as gateways. The Australian Telecommunication Act requires the ability to back track a call from destination to origin, this is established when connecting initial handshake between the two nodes with and is addressed in H.323 Annex D (Nichols & Lekkas, 2002).

Availability

Availability refers to the ability to access and use the service being provided. In this context this means to either make or receive phone calls. Current telephone networks offer a high rate of availability and stability—this sets the benchmark for any technology which may supersede the current network.

The costs for a non functional phone can be not only in terms of the company's reputation but a phone service has now become an expected service which at its worst can be life threatening.

Availability may be enhanced through redundancy. Traditional VoIP implementations have a gateway to interconnect two or more IP networks. In the case of this network becoming inefficient or ineffective there must be some form of an alternative; this may be in the form of many gateways performing some load balancing function. An alternative could be the PSTN gateway located at every branch, allowing not only for redundancy but also the routing of phone calls from other geographical locations to be charged at local call access fees. Companies using a VoIP solution could then be more resilient to a Denial Of Service (DOS) attack which attempts to remove the functionality of the IP network but with intelligent devices this can be overcome to route through an available resource such as an alternative gateway.

Availability is also increased by use of peering networks—the concept of networks providing connection to each other. Generally this is done to improve performance, reduce costs and create better market dominance. Peering is not merging of companies but rather a merge of networks owned by companies. The benefits are matched with some of the following less beneficial properties such as attack from one to the other by diversion, spoofing, DOS, overload etc.

A trust relationship must be established between companies to allocate resources to the other's connected network which satisfy requirements to carry the traffic and generally will not be static. As load increases when demand is greater, it can be assumed the load would be higher during business hours in local time when compared to the middle of the night—therefore it is required that either a well researched usage plan is provided or a real time analysis and network control tool be implemented.

VoIP Orientated Denial of Service (DOS) Attacks

Convergence of voice onto data networks has merged the vulnerability of traditional data network attack methods to affect VoIP as a system. One such attack method is DOS and essentially is the abundance of traffic aimed overwhelmingly a single network device, interface or service. The vulnerabilities of computer networks are well publicised and continually exploited and one must question its ability to provide the infrastructure to voice

networks. However VoIP DOS are not prevalent to this date.

Environmentally Orientated VoIP Attacks

Attacks on the environment where VoIP is existent are a greater concern. DOS attacks and even peak traffic can serious degradation of network QoS and may render VoIP not available. Network management tools exist for both security and performance but this is a consequence from merging the two services on to the one network.

Many concerns have been highlighted with the convergence of data and voice traffic into one sole network. These fundamentally relate to the theory of "placing all your eggs in one basket" which ensures greater loss if the network becomes unavailable.

Counter argument is also valid in terms of the cost reduction in the form of less development, construction, maintenance and management of separate networks. Generally voice has a greater priority during network transmission and this may have adverse results if not configured correctly for both data and voice—generally, with the correct management tools, if sufficient resources are available then the relationship can work gracefully.

EXAMPLE OF VoIP IMPLEMENTATION

Our research examined the marriage of two independent technologies to provide a last mile solution to users. Utilising the 802.11b architecture to form a network of connected clients to allow for VoIP to be accessible in remote communities where cable infrastructure is either non existent or not capable of scaling to new technologies such as broadband equivalent internet access. The primary purpose of the project was to build a conceptual model and determine whether this would work at a carrier grade equivalent. The project aimed at remote centres, i.e. less than 20 dwellings, and therefore focused on clients in a determined radius from one central access point.

Network Model

The model this system proposes is described as Bridged Mode between wireless points. This allows for static connections to exist with little network management requirement for the connection, and securing of connections, in a dynamic period. As phone calls are bi-directional it requires that a connection is not only in the pull model (client generated), but if a call is to be received and the SIP model is used it requires the device to be active on the network to have a call routed to it.

Protocol Usage

The protocol to be used is SIP, since it has been seen to be a better performing solution in the wireless solution that H.323—as this solution only documents within the set bounds the interface to the WAN may transform into another protocol with the appropriate gateway. No security or authentication services will be provided from the SIP implementation; rather these will be developed on the network infrastructure. In case of a WAN outage it is expected a PSTN connection will exist with multiple connection lines to act as a form of redundancy.

Security

Encryption must be applied to this service as the ability to eavesdrop and gain unauthorized access in 802.11b is well documented. The security model chosen is that of a Virtual Private Network (VPN) with the server residing at the remote centre, this may be located at another location if an implementer wishes to secure the entire transit for inter-network transmissions, but this would increase round trip time upon establishment of connection.

The network model discussed above documents that the clients exist in a static position with a connection via antennas and bridged devices. For this reason it is proposed that the VPN client exist within this device to allow

Figure 1. Proposed client structure
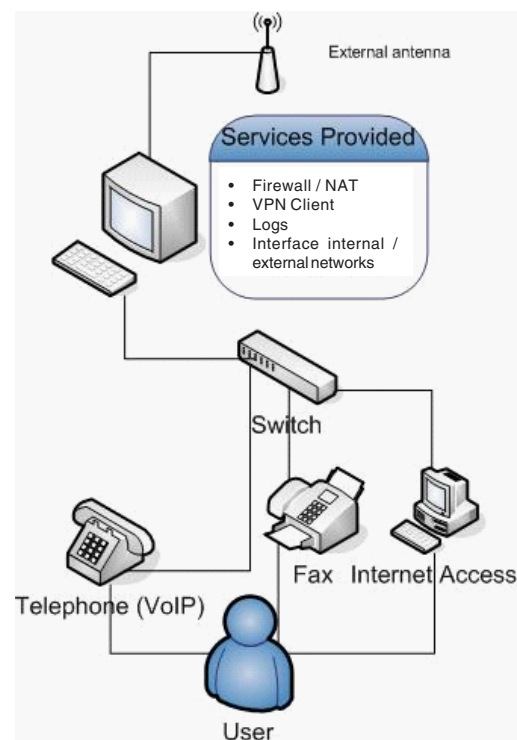
for encryption between the connection point for the client and the central access point. By making the VPN client exists in this device it allows for unencrypted traffic flow within the client's local area network meaning management is less intense. Other benefits include security by abstraction, the VPN service cannot be shutdown as it is part of the boot up and connection to the network and the user would not know of its existence.

Concurrent Connections

The number of simultaneous connections is dependant on the access point, the network performance, and WAN interface among other elements such as codec used. A standard access point can support up to 50 connections, realistically the load bear can handle 25 at reasonable quality. This is based on our research using an Asus WL-300b using an omni external antenna with 31 clients, after this the service degraded substantially. This research did not include any security measures and therefore would suggest fewer connections due to overheads.

It is hard to determine the exact number of connections as is based upon many factors and variables. Realistically for high quality of service if offering both VoIP and internet access (256kbps/64kbps equivalent) using the security measures listed above no more than 20 connections should be made.

As this solution is based on remote town, less than 25 dwellings, and therefore one access point should service this if industrial hardware is utilised. The Asus WL-300b is a mid range access point aimed at small business with the external antenna connections.

DISCUSSION AND CONCLUSION

While 802.11b and Voice over IP may be utilised in the situation described, this is an unreliable and not a true carrier grade solution. The provision of VoIP over the wireless network does pose some issues in terms of performance and quality, but generally these can be rectified with the usage of proprietary solutions. The greatest threat is that of the infrastructure which 802.11b provides.

Placing this system in a remote centre would require constant monitoring which is not available. Cable infrastructure has a higher reliability, but this study has not assessed other wireless mediums. Some of the greatest shortcomings of utilising 802.11b are the use of unlicensed spectrum which allows other devices to readily use this same frequency and degrade service. Moving into a licensed spectrum increases the network capacity, performance, reliability and cost but may be a solution

that will be reviewed with technologies such as GSM, 3G, and GPRS.

It is also noted that such a network may not be viable with the progression of satellite technology. Optus, in Australia, has revealed plans to deploy two new satellites and the possibility of using these to service individual households is not unrealistic with the low cost of hardware, smaller dishes and increasing bandwidth.

However VoIP is continuing to blossom and the marriage with 802.11 infrastructure is continuing. Dominant usage of the two technologies together are for office environments, but we predict within two years mobile phones with 802.11 access will exist within current handsets (GSM, 3G) which determine the cheapest method of call when 802.11 networks are available.

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KEY TERMS

Call Logging: A requirement of the Australian Telecommunication Act in regards to the ability to generate call lists made to or from a particular node on a network with public access.

Eavesdropping: The ability for one to access a call and either in real time or after reconstruct the conversation.

IEEE 802.11b: An established protocol or standard for wireless networking.

Phreaking: The ability to use a phone service without being billed.

Quality of Service (QoS): An indicator of availability and specifies the transmission rates, error rates, and other network performance metrics which can be measured, improved, and, to some extent, guaranteed in advance.

Voice Over Internet Protocol (VoIP): The use of IP networks rather than circuit-switched ones for the transmission of phone calls.

Web Site Development in Action Research

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INTRODUCTION: IN AND OUT OF THE FIELD

Ethnography has traditionally involved the sustained presence of an anthropologist in a physically fixed field setting, intensively engaged with the everyday life of the inhabitants of a given site, typically, a village or other small community. Conventional notions of the field, especially in anthropology which has been the premiere field-based discipline (see Amit, 2000; Gupta & Ferguson, 1997, 1992), involved basic assumptions of *boundedness* (the field was a strictly delimited physical place); *distance* (the field was "away," and often very far away as well); *temporality* (one entered the field, stayed for a time, and then left); and *otherness* (a strict categorical and relational distinction between the outsider/ethnographer and the insider/native informant). The key mode of ethnographic engagement in the field was, and is, that of *participant observation*. When the Internet enters into ethnography, and when ethnography acquires an online dimension either in the research process or in the production of the documentary outputs of research, we end up facing a situation that leads us to reconsider relationships between the researchers and those who are researched. This is especially true of collaborative, action research projects that involve researchers and activists producing materials for the Web.

The first reason for reassessing research relationships in projects that result in creating online information resources, with feedback then resulting from information placed online, and where research is conducted exclusively online, stems from the fact that with research products being made visible and publicly accessible (e.g., an Internet-based ethnographic report), the researcher suddenly faces new questions of accountability, in light of feedback from members of the general public and possibly from the members of one's own host community. Ethnographic accounts, in such a case, are no longer sequestered in specialized library collections, and instead form part of a sometimes vivacious public arena that may be riven with contestation. Second, where ethnographers collaborate with informants, as partners, acting as advocates, and thus coproducing materials for the Web, then once again we are led to reconsider conventional research relationships. Third, where the online extensions of offline fieldwork and collaboration become established features of the Internet domain, these online platforms may attract new constituencies of interest and debate, spawn new networks, and generate almost unceasing peer review that help to foster an alternate, online, dimension of research that, to use a colloquial phrase, "takes on a life of its own."

New information technologies have helped to alter expert–novice relations (Wilson & Peterson, 2002, p. 459). The transformations of ethnographic practice that may result from collaborative Web-based and Web-oriented ethnographic research can be summarized as a series of moves from participant observation to *creative observation*, from field entry to *field creation*, and from research with informants to research with *correspondents* and *partners*. Conventional notions surrounding the gathering of data, the production of knowledge, and the social relationships that both mediate research and are the outcome of research, thus undergo enough transformation that it is no longer absolutely clear where knowledge production begins and ends, who the producers are, or when consumers of information begin to act as coproducers of meaning. With these multiple transformations of ethnographic work, ethics, the normative logic governing research relationships, necessarily provoke new concern.

Thus far, little or no attention has been paid to the process of Web site development as a research method with its own specificities, whether in the literature on (traditional or virtual) ethnography, Internet research, or even *action research*. Even though there is increased recognition of the use of information and communication technology as a potentially powerful adjunct to action research processes, there is a vacuum of published studies on the use of action research methods in such projects (O'Brien, 1998). It is not surprising, therefore, that a subdivision of that area of interest—Web site development—would receive even less attention than the area of *online* action research as a whole.

MAKING A QUALITATIVE DIFFERENCE

Anthropologists are still in the process of determining whether or not ethnographies of Internet users raise *new* ethical questions for researcher conduct, with little attention paid to the subject to date. As some have observed,

"the American Anthropological Association offers no ethical protocols or standards specific to online interactions in its Code of Ethics" (Wilson & Peterson, 2002, p. 461). What Wilson and Peterson (2002, pp. 461, 456) argue is that the online world is embedded in the offline world from which it emerged and is subject to its rules and norms, including codes of ethics developed in standard research settings. The primary ethical concerns laid out in the AAA's Code of Ethics (1998) essentially reduce to norms that can be summarized as no harm, anonymity (unless waived), and consent. This constitutes what may be called a conservative approach to the question of relationships pertaining to online research.

However, different perspectives have been articulated, emphasizing the qualitative differences of Internet research. The Internet raises an array of concerns that traditional *fieldwork* did not. For example, undertaking research in cyberspace poses, "a greater risk to the privacy and confidentiality of human subjects than does conducting research in other contexts" (Young, 2001, p. A52). Jacobson (1999, p. 127) concurs: "questions about the identifiability of human subjects, the conceptualization of privacy, the need for and means of obtaining informed consent, and the applicability of copyright law to computer-mediated communication (CMC) pose special problems for doing research in cyberspace." We might refer to these perspectives as those of moderate dissent, focusing on the unique and substantive challenges of online research, and raising new ethical questions.

A third approach, differing from the two above, does not directly refute, but instead stresses collaborative patterns of research that bridge offline and online areas of activity in ways that render some established ways of posing ethical questions as less than adequate. Ethnographic research that is applied and collaborative in nature becomes action research, where researchers and their partners are now engaged in a deliberate *co-construction* of the public expressions of research. The methodology and its attendant relationships are significantly different from the traditional fieldwork model of the scientific taker and the native giver of information. While conventional vertical research relationships are diminished in favor of more lateral ones, issues raised by the moderate dissenters concerning identifiability, risk, and privacy are also substantially transformed and left open to ongoing negotiation. Questions of anonymity, as just one example, might prove redundant within the context of a particular culture, or given the quest for visibility and recognition that is likely to surface for ethnographers working as advocates with communities engaged in public campaigns.

The bulk of prevailing discussions of Internet research ethics are concerned with synchronous modes of communication (typically chat), or more dynamic forms of asynchronous communication (such as e-mail), with much less attention paid to Web site development and research using Web pages. The focus here then will be on the co-construction of Web-based research expressions, based on a published case study of an anthropologist working with indigenous communities in the Caribbean in both offline and online field settings (see Forte, 2003, 2002).

FIELD CREATION AND CO-CONSTRUCTION

Field creation involves the construction of a Web-based information resource that fosters a community of interacting interests. This resource then becomes a site of research in its own right. The process of field creation in many ways inverts conventional offline anthropological fieldwork, a type of fieldwork to which the concept of field creation implicitly refers. In the process of field creation, the researcher also becomes an informant to his or constituency of "users," fielding questions from a wide public audience; the "site" is created by the researcher; and "informants" might now more accurately serve as "contacts" and "correspondents," while those whom we used to call informants may also be acting as researchers in their own right. Trust and rapport are also transformed by these changed research relationships, not necessarily developing into "friendship," but certainly entailing a form of collegiality in most cases. Indeed, where the field that has been created involves a number of partners (e.g., scholars and activists), negotiating and planning new online documentary products, in constant dialogue with a clientele of engaged and personally interested "visitors," it is not difficult to appreciate how field creation can result in the making of what some term "invisible colleges" (Garton et al., 1997). Participant observation is still a pertinent concept, except that in having helped to produce a site that generates community-like ties, the participant observer stands in relation to his or her work as a creative observer, now part of the foreground and out of the background.

Co-construction is a relatively straightforward concept as it is used here, readily applicable to any research process that involves advocacy or action research, resulting in an information resource that is the result of collaborative work between the researcher and the researched. Informants *qua* partners are no longer the objects of study whose constructions are simply analyzed and dissected by academic analysts. In co-construction, both those once termed informants and those classed as researchers work on research together and jointly produce a community's self-representations. The

Internet has proven to be a very inviting vehicle for co-construction, in that it facilitates ongoing revision, linkage between related documents, wide dissemination at negligible cost, and immediate gratification, that is, the results of research are immediately published online.

Co-construction involves some of the basic ethical assumptions relating to the protection of human subjects, those being beneficence, autonomy, and justice (see Frankel & Siang, 1999, p. 2–3). Co-construction respects the principle of beneficence by seeking to maximize benefits to those whom we would ordinarily consider "research subjects," by enabling their voices to be heard. Autonomy is a key part of co-construction to the extent that subjects *qua* collaborators are respected as autonomous subjects—likewise, the researcher participant maintains his or her autonomy and freedom to reserve endorsement of any particular message or act that may be troubling (see also AAA, 1998, A/5). Justice is respected as a principle of co-construction along the lines articulated by Frankel and Siang, that is: "a fair distribution of the burdens and benefits associated with research, so that certain individuals or groups do not bear disproportionate risks while others reap the benefits" (1999, p. 3). In broader terms, action research may be seen as adhering to a "common good" approach to science, challenging ethnographers and subjects/collaborators to view themselves as members of the same community, and with some higher common goals in common, where knowledge, dialogue, and change are some examples (see Waern, 2001, p. 2).

The specificity of Internet-based or Internet-oriented action research, as suggested by Frankel and Siang is that the Internet "enables some individuals or populations, who might not be able to or willing to do so in the physical world, to participate in the research, hence giving some a voice that they would not otherwise have outside of online research" (1999, p. 4; see also Allen, 1996, p. 186, and AoIR, 2002, p. 12). Wilson and Peterson concur in observing that, "the Web has created a new arena for group and individual self-representation, changing the power dynamics of representation for traditionally marginalized groups such as Native Americans within the discourses of popular culture" (2002, p. 462; see also *Cultural Survival Quarterly*, 1998). At the same time, those who were traditionally "the researched about" in offline settings, now have access to the works of researchers, can argue back (as they often do), and produce alternative materials in their own right. No longer is there a simple one-sided determination by the researcher over what research should be about, how it should be done, and what its results should be—researchers are often called to account (cf. Wong, 1998, p. 179).

Collaborative documentary Web sites, managed and co-constructed by a number of scholars and activists, can be seen as performing a dual function. One involves meeting *external* demands for information (among students, scholars, teachers, development workers, and the wider nonspecialist public). The second function involves meeting *internal* demands for discussion and collaboration (among activists and scholars tied to the particular project in question). It is at this juncture between the external and the internal that one's role as an action researcher/Webmaster raises important issues of trust and ethical conduct.

Research relationships involved in forms of co-construction using the Internet may well be more bilateral than in more conventional field settings, and as a result ethical questions tend to be a little more ambivalent. Ethical concerns, in this case, resemble a two-way street: an action researcher must also protect his or her credibility as a researcher, reflect the best of one's discipline, while also safeguarding his or her own intellectual property as produced online. In other words, it is not merely the informant that needs to be protected. In bringing the results of offline research into the online arena, one must get feedback, engage in consultation with one's informants/collaborators, seek their approval for placing materials online, and, hopefully, work jointly on the actual production of materials to be published online.

In the realm of action research that pertains to the online arena, relationships are a product of constant negotiation and reflexive monitoring; there is no recipe book apart from certain basics, such as protecting one's collaborators from the harm of one's work, if there could be any, as well as protecting oneself from the possible harm of their activities.

In traditional ethnographic research, participants are allowed to withdraw their participation and data at any time. On the Internet, where data may come in the form of a Web page volunteered for inclusion on one's site, this becomes almost impossible to guarantee, for even when a site is removed it may well have been archived in some version, and stored at web.archive.org. Finally, where collaborative research relationships online are concerned, researchers must limit and emphatically qualify their guarantees of confidentiality and privacy online, especially as surveillance, interception, and hacking activities, beyond the control or knowledge of a researcher, are increasingly prominent and intrusive realities of life online.

Modes for developing trust and building rapport, critical to the successful execution of all forms of ethnography, demand that a series of exchange relationships be developed to facilitate action research with an online dimension. Where collaboration occurs between Webmasters, across a range of independent Web sites, some of these exchange relationships may consist of (1) articulating and manifesting *common interests*; (2) developing *related content* across the individual Web sites; (3) fostering, negotiating, and promoting *shared*

perspectives; (4) the deliberate, though often inadvertent *sharing of key symbols*; (5) finding ways of marking *boundaries* uniting the sites in an identifiable group (e.g., Webrings, awards programs, reciprocal links); (6) recognition of *mutual advantage* (the existence of one site on a given topic helping to establish or reinforce the legitimacy of other sites, especially where a neglected or underrecognized subject area is concerned, one that may invite hostile skepticism); and, (7) *regular information exchange* (e.g., through e-mail, listservs, mailing lists, and so forth).

CONCLUSION: CROSSING FIELDS

Issues and concerns pertaining to action research with an online component raise complex ethical questions and different perspectives on research relationships. Keeping the issues distinct, and thus amenable to analysis, remains a challenge. We are effectively dealing with two different understandings of ethnographic work here, the conventional and what some call the virtual (Hine, 2000; Paccagnella, 1997). Moreover, there are at least three different ways in which these two ethnographic modes can be blended, distillations of which were discussed above. One involves the *offline-to-online* move: the products of ethnographic research made available online. Where action research is involved, these products may be fashioned for an online audience as a result of processes of co-construction between partners. A second involves analysis and appreciation of the effects of online publication on offline social practice, or what we may call the *online-to-offline* feedback. A third manner in which action research in an ethnographic mode can be conducted on the Internet can be through what we may call *online-only* means, that is, collaboration between Webmasters and researchers across an array of sites. While in practice (e.g., Forte, 2003) all three uses of the Internet can be combined, we will need greater sensitivity to the finer points of ethics and rapport building in each instance, as well as more case studies, in order to better appreciate the complexities of Web-based and Web-oriented action research. As more ethnographers go online, as well as do their "traditional research subjects" (for example, indigenous peoples in the case of anthropology), we can expect more in-depth reflections and case analyses.

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KEY TERMS

Action Research: Action research, labeled as such, has its origins in British social science research at the end of World War II. There are many types and manifestations of action research, each having in common the goal of researchers engaged in social problem solving. In essence, action research is a value-driven mode of research. Types of action research that are particularly relevant for Internet research and communication practice are educational action research, technical action research, and hermeneutic action research. Educational action research consists of applied learning in a social context, with a focus on solving community problems. Technical action research involves particular persons who because of greater experience and qualifications (for example, in Web design and multimedia) may be regarded by collaborators as a technical experts. In this case, technical knowledge is put to the service of solving a community problem that hinges on communication and public visibility. Hermeneutic action research involves mutual analysis and collaborative documentary research conducted between partners, designed to draw out greater self-understanding and facilitate the articulation of self-definitions for a wider audience. In each case, action research involves the identification of a "problem," an

understanding of *for whom* the research is being conducted, and a notion of some "disadvantage" that is to be addressed or solved through research.

Co-Construction (also Co-Production): Unlike the process of a lone researcher documenting a "construction" (whether this be a ritual, an identity, a discourse, and so forth) that preexists the research project, in this case, the researcher is engaged in the construction along with those that in conventional research would have simply been called "informants."

Creative Observation: This is a phenomenon that pertains to *field creation* (see the definition). This form of observation involves conventional notions of participant observation, with one important difference: that which is being observed has, in fact, been created by the observer, either alone or in conjunction with collaborators (see *co-construction*).

Ethnography: While its Greek etymological origins mean "description of a people," ethnography has two separate meanings. One refers to the process of doing field research with a host community. The second refers to the writing of a documentary text based on that research. Ethnography has been the mainstay of qualitative research in anthropology, owing its modern day origins to the work of Franz Boas, Bronislaw Malinowski, and various researchers at the American Bureau of Indian Affairs.

Field Creation: In traditional ethnographic field research (see *ethnography*, *fieldwork*), an anthropologist would spend time in a "field site" (for example, a village belonging to a tribe) that logically predated the existence of a research project. Field creation involves this process, only in reverse. In this case, an anthropologist or other researcher constructs a particular "site" that then attracts interest and generates a network of social interaction around it—"informants" come to the "site" created by the researcher. The creation of a Web-based information resource that fosters a community of interacting interests, and then becomes a site of research about itself, is one example of field creation.

Fieldwork: Often used interchangeably with *ethnography* (see definition), it is, in fact, less precise and much broader as a concept. Fieldwork may be ethnographic or not, qualitative or quantitative, short term or long term. What defines fieldwork is a situation of doing research outside of the confines of a laboratory or a library, gathering primary data in person, and locating oneself within a given social formation (e.g., a neighborhood, political party, social club, schools, hospitals, etc.). Fieldwork in the ethnographic mode typically involved an anthropologist relocating to a distant society to learn and document another culture, usually involving periods of continuous

stay of a year or more, and relying heavily on *participant observation* as a research method.

Participant Observation: This qualitative research method, long a cornerstone of ethnography in the tradition of Bronislaw Malinowski, involves learning another culture by immersing oneself in the daily routines of one's host community. Observation is not conducted from afar, but from within, by taking part (to the extent allowed) in everyday activities, ceremonies, rituals, work tasks, and so forth. Actual forms of participant observation can vary widely and in accordance with the specific interests adhering to a particular research project.

Wireless in Vietnam

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INTRODUCTION

Although every infant industry is risky, investors are attracted by the growth potential for wireless data services in emerging economies. Access to these markets demands substantial investment capital and scarce skills, plus a solid relationship with a local player able to bring the relevant organisational and political resources into a long-term venture. Even with these assets, many new entrants fail.

Telecommunication is difficult in Vietnam, a narrow mountainous coastal nation of 330,000 square kilometers sustaining most of its 83 million people in rural towns and villages (CIA, 2004). Demand increased with the shift from isolation and central planning to a market economy under the Doi Moi policy. By separating regulation from service delivery, and decentralising local operations, the sector attracted foreign capital. The result is rapid introduction of new technology and accelerated fixed line capacity growth. Today, the national system uses advanced technology to optimize limited physical network capacity. In rural areas, low-cost digital technologies extend network reach at reasonable cost. Despite such successes, mobile services have not developed as expected since their 1992 debut. Even though both competition and private sector participation are allowed, Vietnam has one of the lowest ratios of mobile to fixed line subscribers in South East Asia (Elmer, 2002).

Figure 1. Vietnam and its neighbors

BACKGROUND

By the mid-1990s wireless telecommunications appeared to be an effective solution to both rural and urban connection needs. Implementation required substantial investments in infrastructure, new working relationships among foreign sources of technology and capital, local organisations able to bring political and organizational resources into a long-term venture, and a favorable policy climate.

The industry is volatile, with many potential players courting the few local organisations capable of obtaining government approvals and operating a complex system. Regulators, coping with a rapid transition to a liberalised policy regime, struggle to develop new legislation to govern the sector and meet rising expectations. Foreign suppliers enter any relationship governed by a contract executed in an emergent commercial legal system cautiously. To mitigate these inherent risks, new entrants must select a partner with compatible interests, then formulate market entry and development strategy which will be robust in all likely future contexts.

Demand Factors

Current demand for wireless services stems from a rising number of subscribers, mostly living in

urban areas, and a strong national economy. Export growth accelerated from about 11% in 2002 and 21% in 2003. While official per capita GDP is less than U.S. $500, (Economist, 2004) purchasing power is perhaps five times this, and in major cities is far higher (Worldfacts, 2003).

Projected additional demand-around 13 million terminals equally divided between the Hanoi and Ho Chi Minh regions by 2010-continues to rise in a rapidly developing nationwide market (MPT, 2004). A younger generation perceives the handphone not only as a normal tool to stay in touch, but as a convenient lifestyle symbol. Pager use is declining from the 1997 peak of 120,000 users to less than 10,000 users by late 2003, and state-owned VNPT will suspend service by early 2005. Most pager subscribers will upgrade to handphones as these become affordable (Vu, 2004).

Cellular service subscribers reached 2.3 million in mid-2003 (Economist, 2004) and mobile market growth averages 50% annually. Nation-wide teledensity approaches nine lines per 100 people, with 2.8 mobile users per 100 people. The government recently extended its target date for telephone services in every village from 2000 to 2005 (Economist, 2004).

Even for experienced foreign operators, entering Vietnam's wireless market has not been simple. A new entrant, well-armed with advanced technological skills and access to capital, must select the right technology, identify market factors, attract strong local partners, then work with them to put operations in place. These tasks require a good understanding of the rapidly evolving structure of the national telecommunications policy environment.

Policy Environment

Telecommunications sector regulation falls under the Ministry of Posts and Telecommunications (MPT), formerly the Directorate General of Post and Telecommunications (DGPT), which in 1990 relinquished operational responsibility to state-owned Vietnam Posts and Telecommunications (VNPT). MPT is directly responsible for national policy, frequency management, and technical standards, carries out policy research, and oversees all telecommunications-related joint-venture manufacturing and business cooperation contracts (BCC). The BCC was until 2003 the only legal form for telecommunications services delivery available to foreign investors (Gilbert, 1996).

State-owned VNPT operates a national backbone network interconnecting 53 provincial operating companies, over which it has influence. Separate VNPT subsidiaries provide mobile telecoms (GPC and VMS), domestic long-distance (VTN), data (VDC), and international services (VNI). Despite high tariffs for over-

seas calls, the major source of VNPT revenues, annual traffic growth exceeds 75% (Economist, 2004).

Under its bilateral agreements, companies based in countries which have trade agreements with Vietnam will be permitted to form joint ventures with local partners to provide value-added services from December 12, 2003, provide Internet services from late 2004, and basic telecoms and mobile phone services from December 2005. While MPT is responsible for technical issues, the decision path for controversial issues leads to the Communist Party Political Bureau, which provides conceptual direction, then through the Prime Minister's office, which examines economic issues and prepares implementation guidelines. Local operations are also subject to influence from the military, People's Committees, and other political actors (Von Richter, 2002).

Success is possible: Australian carrier Telestra recognized the emergent demand for an international gateway, linked up with VNPT in 1986, installed an earth station and infrastructure for less than one million dollars, and recouped this modest investment in less than a year. Despite the many potential risks, the Telestra case illustrates the mutual benefit flowing from a correctly structured joint venture, with capital commitments exceeding 200 million dollars governed (until recently) only by a well-drafted memorandum of understanding and carefully aligned interests (Joseph, 2003).

Access to the wireless service market requires meeting four major conditions: adequate financing, appropriate technology, access to national infrastructure and the radio frequency spectrum, access to the wireline network, towers, and underground cables, and finding a local business partner with the appropriate political and organisational assets to sustain project approval, implementation, operation, and expansion over the life of the venture. A foreign operator is expected to package the first two elements, and to team up with a local organisation for the latter. Political influence is the primary means of rivalry for important resources such as frequency allocation, key staff, and capital.

Equity joint ventures are permitted only for equipment production, and until December 2005, service delivery must be carried out through contract joint ventures, which must be approved both by MPT and MPI. MPT and local P&T organisations allocate frequencies only to Vietnamese enterprises, which can pass them to ventures with foreign partners.

Recent Initiatives

The pace of development has been steady, but lags China and Thailand. Land line network operations are fully automated nation-wide, and all urban networks are digital.

Table 1. Pioneer cellular operating companies

MOBILE OPERATOR	ENTRY YEAR	ENABLING TECHNOLOGY	SERVICE AREA/ SUBSCRIBERS (END 1994)
Call-Link Singapore	1991	AMPS (Ericsson)	HCMC: 5,000 subscribers, now marginalised
City-Net Singapore	1992	2-way trunk radio, CT2-based mobile	HCMC, Vung Tau: 200 CT2 subscribers at peak (now defunct)
VMS I	1992	GSM (Alcatel)	Hanoi (4/1993) 800
VMS II	1993-1994	GSM (Ericsson)	HCMC region, 1,800

International traffic flows through earth satellite Intelsat and Intersputnik stations, and maritime fibre-optic cables linking Vietnam with countries in Asia, the Middle East and Western Europe.

The dominant mobile communications standard is Global System for Mobile Communications (GSM), currently used by two major operators, GPC (the Vinaphone network) and VMS (the Mobiphone network). AMPS is used by Call-Link, a Ho Chi Minh City mobile operator with a tiny market share. The S-Fone network, a 2003 joint venture between Saigon Postel and South Korea's SLD Telecom, uses Code Division Multiple Access (CDMA) technology (Vietnam News, 2003).

Providing higher-quality voice service and multimedia messaging service (MMS), S-Fone's 144 kbps data transmission speed is several times faster than GSM. However, incompatibility with GSM data protocols restricts transfers of MMS content. To compete with S-Fone, GSM operators MobiFone and Vinaphone recently upgraded their networks with higher data rate General Packet Radio System (GPRS) technology, and are reportedly considering Third Generation (3G) technology. However, there are few mobile data services applications or local content providers (Hoa, 2004).

MPT has allocated commercial frequencies to more than forty applications. While frequency allocation follows international guidelines, there are unlicensed spectrum uses which the government has not until recently been able to detect and enforce. Various military units, police agencies, and units of the Communist Party have acquired and continue to control significant portions of spectrum.

Ten years ago, one in ten rural villages had telephones. By 2003, more than 9 out of 10 Vietnamese communes had phones, with access for 1,728 out of 2,362 difficult communes, 319 out of 401 border communes, and all island communes. The policy target is universal access to voice service by 2005, when policymakers hope every village will have an exchange of 50 to 100 lines. To expand telephone services in remote areas VNPT signed a contract with Ericsson in Feb 2004 to provide digital switching for the Central Rural Telecommunications Network project (Ericsson, 2004).

One rural design solution features wireless digital switches developed by India's Centre for the Development of Telematics (C-DOT). An integrated switch-cum UHF radio transceiver, developed by researchers in Bangalore, ships in kit form. The Posts and Telecommunications Research Institute assembles and tests the C-DOT 10-channel switch, and provides maintenance. NEC, Alcatel, and Ericsson have all sponsored rural applications trials near urban centers. More recently, SR Telecom and Phillips TRT have entered the rural point-to-point microwave market. DGPT and Phillips formed a joint venture to produce the IRT 2000 TDMA multi-access radio system (Elmer, 2002).

Opportunities for Foreign Suppliers

Once in operation, the key tasks are to capture market share, deliver quality services, and generate profits. Marketing practices are relatively straightforward, but can be expected to improve as competition heats up and players gain experience. Although the legal mode for operations is prescribed, market entry remains an open choice. Alternative wireless telecommunications market entry modes available to a foreign equipment manufacturer include:

1.   Offering specialized equipment to meet needs through a channel partner.
2.   Joining another foreign supplier seeking to enter the Vietnamese market to offer a total network solution, and providing components.
3.   Joining other foreign suppliers to offer a total network solution, while committing to local production and training as required by policy.
4.   Making a long-term commitment to Vietnam's development, and helping put a portion of the necessary institutional framework in place, as an integral portion of its market development.

These modes differ significantly in terms of commitment and scope for strategic long-term development. The first option consists of little more than trading,

while the latter offers the most scope to initiate activities with long-term value for both parties. Table 1 describes early entrants to Vietnam's mobile markets, all of which attempted the second mode.

As revealed in the table above, a decade later only two of the four pioneer mobile operators remain viable. The primary sources of risk in any of these approaches include (Gilbert, 1996):

1. Poor fit between activity and investment mode
2. Difficulty obtaining an appropriate local partner
3. Inability to provide adequate financing
4. Failure to obtain a frequency allocation
5. Lack of permits, licenses, and other permissions
6. Inability to resolve legal conflicts

The key planning tasks are to identify likely sources of, then determine whether they will have critical effect on the viability of a specific project, such as the AMPS-based HCMC mobile telephone joint venture. One technique which is useful for this type of planning is scenario analysis.

SCENARIOS FOR OPPORTUNITY ANALYSIS

A scenario is "A hypothetical sequence of events constructed for the purpose of focusing attention on causal processes and decision points." (Kahn & Weiner, 1967) At the confluence of game theory and simulation, scenario planning is useful for exploring interactions between current choices and future consequences. The modern scenario began as simulation to evaluate whether the first nuclear weapon might extinguish all life on our planet (Davis, 1968). After the Rand Corporation developed scenario planning for Pentagon use, SRI International adapted it to corporate planning (Mandel, 1982).

Forecasting is inappropriate when the future is likely to be affected by events for which there is no historical precedent, or trends that are not simply extrapolations of the present. A scenario represents those dimensions of an alternative future that are critical to decisions actually at hand. Based on explicit assumptions, each scenario provides a logically coherent description of fundamentally different futures, and explains the interactions among key elements from the present to some end point. The technique facilitates learning at low real and opportunity costs in dynamic contexts.

Stakeholder Identification and Involvement

The first step is to identify stakeholders, who normally include top management, key functional managers, customers, and owners, stockholders, or other sponsors. The next is to involve stakeholders in the planning process, which makes planning more realistic while paving the path toward adoption of the resulting plan. One approach is to ask stakeholders to forecast the future environment.

Building Multiple Scenarios

Drafting a scenario requires cooperation among functional specialists and external experts, who identify decisions that are sensitive to environmental factors. Participants then postulate future values for these factors, later used to test the viability of alternative strategies. Delphi and cross-impact techniques (Helmer, 1981) help identify critical scenario dimensions, and differentiate structural from parametric variables.

From potential decisions, the analysis path leads outward to task-related decision factors (*internal political forces, constraints to trade, demography, etc.*) that affect outcomes. The next ring contains remote drivers (*the economy, shifting lifestyles, trade blocs*) of the future values and states of decision factors. Planners reduce the many permutations of interactions among values to a few contrasting, yet plausible sets (Schnaars, 1987). These "scenario logics" focus attention on interplay among environmental forces and decision factors under divergent assumptions about the future (Huss & Honton, 1987).

The next step is to select from two to four scenario logics. A wireless operator considering a new investment would first identify critical variables in its task environment. These might include national standards for telecommunications technology, regulations governing spectrum licensing and foreign investments, and relationships with potential joint venture partners. External factors include growth in personal incomes, national and regional policy governing market access, frequency allocations, and access to national and regional infrastructure.

Three dimensions, each with two states, economically represent an institutional scenario structure. As some factors overlap, the draft set could include only the four in Table 2. Here, the normatively healthy "ASEAN, Inc" scenario describes an open policy regime in which balanced and stable internal and external relationships drive economic and social development, opposite to "Troubled Waters." A "Cities First" scenario

Table 2. *Four scenarios for 21ˢᵗ century telecommunications*

SCENARIO Dimension:	Munificence	Stability	Harmony
1. ASEAN, Inc:	M+	S+	H+
2. CITIES FIRST:	M+	S+	H -
3. ZERO-SUM:	M -	S+	H -
4. TROUBLED WATERS:	M -	S -	H -

LEGEND:	
M.	**Munificence**: resource availability vs. scarcity
S.	**Stability**: absence of intense internal or regional political or economic conflict
H.	**Harmony**: the balance between rural and urban access policy.

describes a situation in which rural interests are unable to capture needed resources, while "Zero-Sum" portrays intense competition for scarce resources.

Once fully developed, these environments provide contexts for testing alternatives. The final set of scenarios should be (Schnaars 1987):

1. Concerned with relatively long time frames,
2. Focused on a set of related choices,
3. Limited to environmental trends and events,
4. Representative of the full range of uncertainty,
5. Attuned to the current environment.

Draft scenarios are the basis for more elaborate treatment and analysis. The goal is to find the critical issues, threats, and opportunities emerging from each scenario, and to identify those policies which will be the most robust in the more likely outcomes. Once this understanding is reached, the focus returns to current decisions. Analysis is largely qualitative until this final stage of scenario planning.

From Strategy to Implementation

When scenarios are complete, the focus shifts to task-level factors that affect the outcomes from key decisions. At each step, multiple scenarios highlight specific needs for domain knowledge, define boundaries for analysis, and differentiate critical variables. For a wireless project, the steps include:

1. Design politically and financially viable projects around viable technology and legal structure.
2. Select a partner with political and organizational assets, then manage toward joint benefits.
3. Package technical training and management development with all technology proposals.
4. Design systems and plan growth to overcome inherent infrastructure restrictions (e.g., frequencies, power, tower space, underground cable, interconnection to other networks).
5. Seek advisory and liaison services from a strong but independent local consulting firm prior to preparing and submitting proposals to potential partners or the government.
6. Structure relationships (when possible) for the long term, even though many key contractual commitments or policy issues are uncertain at the early stages.

By examining each step in the light of contrasting scenarios, a policymaker acquires understanding of the challenges facing investors. Similarly, potential investors can highlight issues that are more critical under some scenarios than others. For example, if under the Cities First scenario, urban interests capture scarce resources, funding for rural infrastructure may be constrained.

Vietnam faces stiff competition for capital from other Asian economies, and must address four main challenges to build national information infrastructure that compares with other ASEAN members: raising sufficient capital, integrating the diverse technologies currently in use, reforming excessively inefficient administrative processes, and developing adequate technical and management skills. Some legacy equipment, obtained through aid mechanisms, is recent but incompatible. MPT officials claim deregulation is underway, and investors are increasingly confident (Larsen, 2002). Yet manpower development on the scale needed to maintain advanced networks is a critical bottleneck. This may be difficult within the institutional tradition of Vietnamese academy, which typically provides technical training to a small number of students through close supervision by a senior faculty member.

CONCLUSION

By using scenario analysis to identify critical bottlenecks, then acting to avoid or overcome these restrictions, policymakers in emerging economies can smooth the path for telecommunications investments. Investors can also benefit from scenario analysis. Investment always entails a certain degree of risk, particularly in a poorly structured situation such as the wireless market in a developing country with an immature commercial legal system. Using this technique, preventive decisions and actions can be identified, which if executed with care, will overcome many significant barriers to success in turbulent contexts such as the emerging market for wireless services in Vietnam. In an emerging economy, the scenario technique can guide the leap from obsolete and inadequate networks to a fully modern digital infrastructure providing high-quality basic services to every village, and state-of-the-art services to business subscribers and consumers in its cities.

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KEY TERMS

3G (Third Generation Mobile Network): Popular term for high speed mobile cellular networks.

AMPS (Advanced Mobile Phone Systems): Obsolete cellular phones standard.

BCC (Business Cooperation Contract): Vietnamese form of contract joint venture.

CDMA (Code Division Multiple Access): Transmission technique for 2nd/3rd generation networks.

GSM (Global Systems Mobile): Industry standard for 2nd-generation digital cellular networks.

ITU (International Telecommunications Union): UN organization to harmonise telecommunications policy, technology.

MPI (Ministry of Planning and Investment): Vietnamese agency that coordinates investment and industrial activity.

MPT (Ministry of Posts and Telecoms): Vietnamese regulatory body for telecommunications, formerly DGPT.

Workarounds and Security

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BACKGROUND

The project uses an actor network (ANT) framework. The value of this approach in relation to the adoption of technology is well established (Callon, 1987; Latour, 1996; Star, 1991; Law, 2000). ANT presents an alternative to the concept that innovations spread by diffusion. The adoption of innovation is seen rather as complex and unpredictable, laborious and political.

Brey (1997) summarising common features of the social constructivist approach and the ANT approach describes technological change as a number of technological disagreements or difficulties that involve different human and non human actors, including the technology itself and natural forces, who engage in strategies to shape technology use to their own plan.

ANT is interested in description, rather than judgments about the proper purpose of artifacts or about how well or badly an artifact may be operated (Brey, 1997). The benefit of avoiding evaluation in research is that the situation may be studied without projecting the direction of changes (Suchman, 1994). The researcher's task is to describe what is and how it came about so that the actors can make choices about appropriate future directions.

Workarounds

Workaround is an informal term, which is grouped with concepts like boundary crossing, substitution, circumvention, detour, improvisation, fixes or kludges. Workaround may have a deliberately political aspect, such as resistance (Pollock, 2001), or intentional subversion such as using a computer in ways for which it was not designed or avoiding a computer's use (Glasser, 1986).

Workaround has a user focus, often it represents the view of those who are not authorised to change the system. Frequently the people doing these fixes get the technology to work despite their limited knowledge of computers. However, to identify a workaround involves adopting a position of knowledge of a real or authoritative purpose that is dissonant with the local application. In this way an action may be perceived as a workaround by some people but not by others.

The study is conducted in the anthropological fieldwork genre of participant observer, based on that used by Latour (Austrin & Farnsworth, 2002), formal and informal interviews, workplace observation and conversations with staff and IT technicians were drawn over a two year period.

This study takes place on a small island in far North Queensland, Australia, 180 kilometers from the local business centre and 1000 kilometers for the regional business center. The population is approximately 150 and all but one of the permanent residents are indigenous. Services available on the island comprise a general store, a primary school and a medical aid post. There is a church and the council which provides municipal services. The council administration office is the setting of the project.

A short exchange is used to launch my analysis.

THE STORY

Jane says: "Excuse me Anna, before you go could you log me into your computer, I want to look at the payroll....wait a moment, your Windows screen save will lock me out anyway...no, I don't want to know your network password, or your screen saver password."

Anna says: "Well, you could ask Susan to log you in, or I could disable the screen saver like this, and you just put it back on when you are finished."

ANALYSIS

"What can we learn from this short exchange?" Jane, the visiting consultant, asks Anna, the senior clerk, to log her in, using Anna's user name and password. Then Anna accepts Jane's right of access is shown in her willingness to do it, she actually offers three alternatives. Furthermore, it is not a subversive request, she suggests Jane could also ask Susan, the council clerk to do it.

It shows the office social network being reinforced by Jane's seeking help, and acknowledging Anna's ownership of the computer.

Also evident is the fact that the responsibility for making even small changes to the set-up has been placed outside the workplace, with the remote technician. The staff neither attempts to do it themselves, nor call the technician to be talked through the process.

A number of distance related factors could be identified as underlying this situation. The small population means there is a limited local technology context: while television and telephone are almost universal only the council and the school have access to a range of technology and only two households have personal computers. This means that of the people using technology, most are using it in an institutional or work setting and do not have personal responsibility for the technology nor unrestricted freedom in its use.

Small population and remote location also mean social isolation. There is a limited local community of practice to share technological experiences, foster skills or boost confidence. Furthermore, a small population cannot support experts, the few people with jobs must do a wide range of tasks. Expertise is bought/brought in. It takes time to develop the relationships and mutual respect essential for information exchange or skill sharing with outsiders.

The geographic distance from technology centres increases the costs to the technology owner: the length of time it takes for a technician to travel to these areas makes it too expensive to have problems fixed as they arise. The electronic security issue we are talking about here becomes relatively unimportant when it may wait up to six months for the next routine service visit: the existing physical or screen saver security suffices.

The technician views network setup in an urban environment as an ongoing process, he talks of the need to "tweak" the system, to "bed the system down" with many small adjustments. In remote situations there is little opportunity to tune a system and there is frustration on both sides when simple things do not work. He is reluctant to take on a network administration role such as can be offered to urban clients because the travel time. He does offer unlimited telephone support, however, this service is used less frequently now than two years ago.

The technician has set up the security for the network in this way because he believes that it is in the council's long term interests to conform to the standard system, and that future flexibility options of the system will require this form of security.

The council clerk had some clear ideas about the security she required, she believed she had discussed these and reached agreement with the technician. Her understanding differed from how the system has been set up. Orlikowski (2000) offers some explanation for this sort of situation when she states that the use of technology is strongly influenced by users' understanding of its properties and functionality, and that these may have been formed from a wide variety of sources, including social and cultural contexts. In this instance although each understood the other's words, their interpretations were different.

In a remote or isolated area sources of information are limited, adults on the island report that their children are their major source of technological information. Even more limited are sources of information relevant to their particular situation.

When the network was initially installed the technician set a simple hierarchical security system. The local response to this was that three out of four users logged on to the network as "administrator" in the first server and all users assigned themselves administrator rights in the second server. In the current system the technician has restricted the access of all users while allowing access to some administration tools by the council clerk. The result is that very few network issues are resolved locally, however there are fewer problems.

Jane is the one who calls for this workaround. She has done so to get the job done, but also in her "role" as consultant she has didactic purpose in rejecting the offer to share passwords. In Latour's terms she is acting as the "moral agent", reminding staff of the standard business practices (1992).

This situation is not restricted to remote regions, but distance increases the degree of difficulty. Guerson and Star (1986) discussing the sociology of work describe organisations as characterised by ongoing negotiations about the nature of the tasks and the relationships between staff, ad hoc decision making when dealing with problems, by multiple viewpoints and inconsistent and evolving knowledge bases. Workers in remote locations seldom experience other workplaces so any change must be conceptualised rather than copied from others' work practices. In this case none of the staff had used a network prior to its implementation, and this system is still their only experience of a network.

In this example we can trace the interests or goals of actants in a chain from the design engineers who encode best practice commercial concepts in the software; through the technician to set it up who understands the technical relations between machine and software more than he understands the business procedures, particularly the local procedures; then the consultant who must work with the system and who knows the general business context but has limited experience with the technical and local contexts; to the users who create the local context and have limited experience and only some academic knowledge of the general business context and limited experience with technology. Even at this most superficial level we can see how each brings his or her experiences and areas of expertise to the situation and must try to communicate their understanding to the other actors.

The chain is a process of literally changing languages from design generalisation, with the language of flexibility and choice, to technical language of hardware

and implementation, to the language of business concepts to local languages (Kala Kawa Ya and Creole are spoken at home, English is the third language) and local workplace culture. Latour (1987) describes the process through and across networks as "translation" and as such it is subject to faulty or incomplete portrayal. In this situation the term translation is doubly significant.

CONCLUSION

Two things have been done in this article, to look at the utility of workarounds as a focusing device for study, and to look at the effects of distance on technology implementation in a small remote workplace. This research is exploratory and descriptive, it is not generalisable; neither does it provide suggestions for changing or improving technology implementation in this or other situations.

Workarounds as a research tool alert us to the issue of the standards we hold against which we compare local practice. Workarounds provide a political perspective; in this project they illuminate aspects of local control. Workarounds need to be understood as making sense in their context and thus provide insight to the local context. Workarounds are a small but normal part of how things work.

The project has shown three aspects of distance. Conceptual distance from design intention to local practice; geographic distance from technical skills making assistance uneconomic; geographic and social distances from an active technology context affecting the confidence and experience of local users; and cultural distance experienced in language and way of living in the world. We have also touched on a theory of technology adoption that uses the concept of translation to explain how a new technology can cover these distances. Bruno Latour (1987) states that "translations may be weakened, substantially changed or not survive the distance" (p. 108) and this description of a problematic and contingent process of technology adoption accords with our experiences.

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KEY TERMS

ANT: Actor Network Theory.

Best Practice: Industry agreed best way of doing a process.

Diffusion: A model that the uptake of an artefact is dependent on its intrinsic merit being easily recognised and passed on to other people.

Indigenous: Original inhabitants.

Remote: Geographically distant from a centre with technology support.

Security: System of user names and passwords to control access to programs and information on the computer and network.

Standard: A level of performance set by agreement amongst experts in the field.

Translation: The interpretation given by the proponents of a system of their interests and the interests of the people they are trying to convince.

Workarounds: Informal or unauthorised changes to a computer system to bypass a problem.

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