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Marc J. Epstein
John Y. Lee

Editors

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INTRODUCTION

This volume of *Advances in Management Accounting* (AIMA) begins with a paper by Bento and White. This exploratory study aims at identifying the main characteristics of strategic performance measurement systems that influence the system outcomes and firm performance. Using data from nearly 2,000 companies in a wide range of industries, they employed path analysis and stepwise regression to test the model, and found empirical support for the model. The strategic performance measurement systems have a significant effect on human resource practices and business results. The degree of balanced scorecard adoption, the impact of the systems on human resources, and the use of nonfinancial performance measures were found to have the most effect.

The next paper by Sim, Song, and Killough addresses the issue of service quality, service recovery, and financial performance. Using the airline industry for the 1990–2006 period, the study finds that "complaints" is a leading indicator of future financial performance as measured by return on sales one-quarter ahead. This effect persists into longer term future performance as measured by return on assets and return on sales. Findings also indicate that service recovery effort in reducing mishandled baggage is associated with higher future financial performance. Similarly, service recovery efforts, in reducing mishandled baggage and complaints, are found to be associated with both short-term and long-term future financial performance. Nevertheless, this relationship diminishes when flights have a higher "load factor." Literature on service operations states that although service failure (such as flight cancellations, delays, misconnections, mishandled baggage, or over boarding) can negatively affect customer repurchase intentions, employees' ability to diagnose and respond to the problems at the critical moment can overcome negative effects of a service failure. This suggests that management should consider having trained front-line employees and flight attendants provide comfort, assurance, empathy, support, and assistance to customers following service failures. This should help to enhance repurchase behavior and brand loyalty thereby improving future financial performance.

The paper by HassabElnaby, Mohammad, and Said studies the relationship between nonfinancial performance and earnings management. The paper examines the earnings management implications of using nonfinancial

performance measures in executive compensation contracts. It tests the hypothesis that when a manager's compensation is based on financial and nonfinancial performance measures, he/she has less incentive to manipulate earnings to maximize compensation. Using panel data covering the period 1992–2005, they compare earnings management behavior for a sample of firms that used both financial and nonfinancial measures to a matched sample of firms that based their performance measurement solely on financial measures. The results are consistent with a reduction in earnings management behavior for those firms that rely on nonfinancial performance measures in their compensation contracts.

The next paper by Hutchinson looks at the impact of cost accounting system design on manufacturing performance. Using a simulation approach, the study examines the impact of three cost accounting system designs – traditional costing, activity-based costing, and time-based accounting – on manufacturing performance as measured in terms of demand fulfillment rate, cycle time, and net operating income – within a flexible, pull-production environment. A simulation approach allows for the direct comparison of these cost system designs under various scenarios. The introduction of supply and demand stochasticity, along with differing levels of product mix complexity modeled in environments with differing levels of manufacturing overhead burden, adds practical significance to the results. The fact that no single-cost system outperformed along all performance measures has considerable implications for management accounting practice vis-à-vis manufacturing strategy, in particular for competitors in time-based industries, such as aerospace. This is the first known study to operationalize and test the theoretical time-based accounting methodology, further validating the efficacy of simulation methodologies in cost management contingency research.

In the next paper, Allport, Brozovsky, and Kerler examine how decision preference impacts the use of persuasive communication frames in accounting. On the premise that capital budgeting decisions frequently go awry, they investigate whether the party gathering the data utilizes persuasive communications when presenting the information to a superior. This study analyzes whether the information is framed differently, depending on his or her opinion. Since prior research has shown that differential framing of the same information affects decisions, this may be one contributor to capital budgeting failures. The study found that participants did frame the information differently depending on whether they chose to accept or reject the project. Our control group, no decision required, was materially different from the reject group but not materially different from the accept group.

The paper by Herath, Bremser, and Birnberg looks at a collaborative balanced scorecard (BSC) as an open reporting system that facilitates a team culture. The BSC allows firms to place importance on both financial and nonfinancial performance measures in four perspectives for developing and implementing corporate strategy and performance evaluation. The BSC literature, however, provides minimal insight on how to set targets, how to weigh measures when evaluating managers and the firm, and how to resolve conflicts that arise in the BSC process. Researchers have attempted to fill these gaps using two contending approaches: Use an agency model to select the optimal set of weights or a mathematical programming-based collaborative decision model to find the optimal set of target and weights considering inputs from two parties. In this study, the authors apply the Herath et al. (2009) model to a detailed BSC example. They demonstrate how the collaborative BSC model can be implemented in Microsoft Excel by practitioners to minimize BSC conflicts. They also discuss how the model facilitates alignment and a culture of open reporting (information sharing) around the BSC that is necessary for its effective implementation.

In the next paper, Cote and Latham report on behavioral implications in interorganizational alliances. Building on prior research linking stakeholder relationship quality with financial performance, the study examines the interorganizational engagement from a bilateral perspective, more fully representing the dynamics within an alliance. Interorganizational relationship quality and stakeholder management theory in healthcare and in accounting research provide the foundation for these insights. While the study's findings demonstrate consistent views regarding the importance of relationship management and patient care, the two stakeholder groups hold divergent perspectives on how to accomplish these goals. Insurance executives take a population perspective, whereas physician practices focus their decision making at the patient level. The relative power and size between stakeholders was instrumental in how insurers chose to develop relationships with individual physician practices. These findings provide the nucleus for understanding reported frictions.

The paper by Héroux and Henri examines the relationship between management control and web-based corporate reporting. While the idea of control packages goes back to the early 1980s, there has been a lack of empirical management accounting research on this broader view of management control. Past research has addressed the use of management control for the organization as a whole, as well as for specific objects of control. While those objects of control typically involve information available for internal uses, we do not know much about the role of management control when

the object of control is comprised of information intended to be disclosed outside the organization. This study examines the role of a control package to manage web-based corporate reporting. More specifically, this study looks at the antecedents and consequences of a management control package related to website content. The results suggest that perceived environmental uncertainty and stakeholder orientation are the key factors that influence the extent of the use of the management control package. Moreover, the extent of using a management control package is associated with the quality of website content but not the quantity of information disclosed.

We believe the eight papers in Volume 18 represent relevant, theoretically sound, and practical studies the discipline can greatly benefit from. These manifest our commitment to providing a high level of contributions to management accounting research and practice.

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AN EXPLORATORY STUDY OF STRATEGIC PERFORMANCE MEASUREMENT SYSTEMS

Al Bento and Lourdes Ferreira White

ABSTRACT

This exploratory study aims at identifying the main characteristics of strategic performance measurement systems (SPMS) that influence SPMS outcomes, which, in turn, impact firm performance. Using data from 1,990 companies in a wide range of industries, we employed path analysis and stepwise regression to test the model. We found empirical support for the model, in that SPMS have a significant effect on human resource practices and business results. The degree of BSC adoption, the impact of SPMS on human resources, the purposes for which the SPMS were designed, and the use of nonfinancial performance measures were found to have the most effect on the impact of the SPMS on business results.

1. INTRODUCTION

Strategic performance measurement systems (SPMS) have been gaining popularity in a broad range of organizations over the last decade. Organizations frequently rely on SPMS to implement organizational change, in response to a change in strategic direction. According to

Chenhall (2005), SPMS can take many forms, but share in common a distinctive feature in that "they are designed to present managers with financial and nonfinancial measures covering different perspectives which, in combination, provide a way of translating strategy into a coherent set of performance measures" (p. 396). Examples of SPMS include performance pyramids and hierarchies (Dixon, Nanni, & Vollmann, 1990; Lynch & Cross, 1995); the service-profit chain (Heskett, Jones, Loveman, Sasser, & Schlesinger, 1994); the intangible asset scorecard (Sveiby, 1997); the *tableaux de bord* (Epstein & Manzoni, 1997); the action-profit linkage model (Epstein, Kumar, & Westbrook, 2000); and, most notably, the balanced scorecard (BSC, first proposed by Kaplan & Norton, 1992).

According to a recent survey of the Institute of Management Accountants' Cost Management Interest Group, the BSC is rated as one of the three most beneficial organizational practices, scoring even higher than cost management techniques (Krumwiede & Charles, 2006). Despite this perceived potential benefit from BSC implementation, the same survey revealed that a much lower number of respondents reports actually using the BSC in their firms. Other surveys have placed the BSC as a predominant performance measurement tool; for example, Silk (1998) estimated that three out of five Fortune 500 companies have implemented a BSC. Little is known, however, about the actual effects of BSC implementation, and whether SPMS have indeed brought about organizational change as intended.

The popularity of SPMS among practitioners has sparked a similar interest among management accounting researchers, who set out in the mid-1990s to produce a new stream of literature about the SPMS. This literature has been progressing and changing its focus gradually through three distinct phases which we characterize as: the "how-to" phase, the "what-else" phase, and the "so-what" phase.

Soon after Kaplan and Norton's seminal article on the BSC in 1992, several authors have addressed the technical aspects of "how-to" design SPMS (Neely, Gregory, & Platts, 1995; Neely, Mills, Platts, Gregory, & Richards, 1996; Kaplan & Norton, 1996). The main concern of this first phase of the SPMS literature was to prescribe for practitioners different methodologies for selecting customized performance measures that would help complex organizations implement their strategies. Researchers during this "how-to" phase did not explicitly question whether SPMS were necessary for strategy execution; the implicit assumption was that if most Fortune 500 companies, agencies at all levels of government, and charitable organizations were implementing SPMS, then they must add value.

By the late 1990s, academicians became more concerned with the process of implementing SPMS and the potential obstacles to SPMS success (Bititci, Carrie, & McDevitt, 1997; Bourne, Neely, Mills, Platts, & Wilcox, 2000). During this ''what-else'' phase, researchers were concerned with identifying what other variables were critical for successful SPMS implementation, the role of top-management commitment, and the indispensable need for clearly articulated strategies for SPMS to work (Kaplan & Norton, 2001a). For example, the European Foundation for Quality Management (EFQM) proposed a supplemental framework to the BSC called the Business Excellence Model, which included enablers such as leadership, policy, and strategy, which were seen as necessary antecedents to the results intended for SPMS (EFQM, 1999). While the ''what-else'' phase was helpful in explaining the role of contextual variables for SPMS implementation, it did not directly measure the impact of those variables on BSC design and adoption, nor did it provide consistent evidence on SPMS results.

Within the current decade, the SPMS literature has shifted its focus to ascertain if SPMS implementation has, in fact, a significant impact on business performance. This ''so-what'' phase started with simple tests of the impact of the use of a particular performance measure on actual financial performance (e.g., Behn & Riley, 1999, in the airline industry; Banker, Potter, & Srinivasa, 2000, in the hotel industry). More recently, the performance measurement literature has shifted to investigate the specific attributes of the SPMS and the intervening variables that link SPMS characteristics to their performance effects (e.g., Ittner, Larcker, & Randall, 2003). After evidence that some early adopters of BSC had little success with the use of more subjective, nonfinancial measures (e.g., Ittner, Larcker, & Meyer, 2003 described how a global financial services firm decided to drop the BSC in favor of an incentive compensation plan based on revenues only), performance measurement research has evolved to investigate, document, and actually measure the performance results of SPMS adoption (e.g., Burney & Widener, 2007).

This study aims at contributing to this emerging ''so-what'' performance measurement literature by introducing three main innovations. First, rather than conducting isolated tests of how particular features of the SPMS affect performance, we develop a comprehensive model, drawing from both the accounting and information systems literature, to describe how SPMS characteristics influence SPMS outcomes, which, in turn, affect performance. Second, we propose two new variables (design purposes and degree of BSC adoption) to investigate their role in explaining SPMS performance effects. Instead of using a dichotomous variable to classify adopters versus

nonadopters of the BSC, based on the respondent's claim about whether his or her business unit adopted a BSC, we used a composite metric to capture the varying degrees of adoption of the BSC, according to Kaplan and Norton's strategic map (2001a). Third, we evaluate organizational change in terms of performance effects using a multidimensional approach, consistent with the causal models of the BSC: first, by testing for the impact of the SPMS on human resource (HR) practices; and next, by gauging business performance in both operational and financial results. We tested this model using extensive empirical data from a cross-sectional sample of 1,990 organizations, including companies from every single Dow Jones Global Industry Group. Our empirical results support the proposed model, and provide additional empirical evidence for the assertion that integrated SPMS (such as the BSC) impact performance positively.

This paper is organized in six sections. This introduction is followed by a section that identifies the model and defines the eight variables selected for this study. The third section states the research question and proposes the six hypotheses we tested empirically. The fourth and fifth sections include a description of the research methods and the results from our path analysis, respectively. In the sixth section, we offer a summary and concluding comments, and discuss the implications of this research for the ongoing SPMS literature and for practitioners interested in SPMS implementation.

2. STRATEGIC PERFORMANCE MEASUREMENT SYSTEMS

SPMS, despite the various forms in which they have been implemented, have three characteristics in common:

- they include financial measures that capture the short-term consequences of managers' decisions regarding issues such as revenue growth, asset utilization, and cash flows (Kaplan & Norton, 2001a; Rappaport, 2005);
- they supplement financial measures with nonfinancial measures that indicate operational achievements likely to drive future financial performance;
- they are designed to fulfill multiple purposes, from simple cost determination to complex value creation, with an emphasis on strategy execution.

In this study, we examine each of the above characteristics and their influence on various outcomes of the SPMS. As shown in Fig. 1, the characteristics of the SPMS are expected to determine (directly or indirectly)

Financial measures	**Nonfinancial measures**	**Design purposes**
• Revenues	• Customer satisfaction	• Business results
• Growth	• Market share	• Individual performance
• Gross margin	• Quality and process-related	• Reward and recognition
• EBIT	• Innovation/product devel.	• Directives
• Net operating income	• Time, speed, agility	• Operations
• EPS	• Supplier	• Capital
• ROI	• Regulatory and compliance	• Technology
• EVA	• Productivity	• Strategy
• Cash flows	• Employee turnover	• Suppliers
	• Demographics	• Customer relationship
		• Values and culture
		• Decision making

SPMS characteristics

Information quality	**Effectiveness**	**Degree of BSC adoption**
		• Employee performance
		• Compensation
		• Technology
		• Suppliers
		• Customers
		• Capital investment
		• Business performance
		• Shareholder value

SPMS outcomes

Impact on Human Resources	**Impact on Business Results**
• Leadership	• R & D
• Structure	• Innovation
• Control practices	• Cycle time
• Recruitment	• Process improvement
• Training	• Alliances/joint ventures
• Turnover	• Pricing
	• Quality
	• Revenue growth
	• Productivity
	• Strategy

Business performance

Fig. 1. The Model.

the quality of the information it provides, its effectiveness, and the degree to which the BSC is adopted. These outcomes, in turn, contribute to improved firm performance, first in terms of their impact on HR practices, and next in terms of improved business results.

2.1. SPMS Characteristics

2.1.1. Use of Financial Measures
Financial measures of performance are relevant to senior managers as short-term feedback on the results of their past initiatives aimed at increasing shareholder value. In the BSC framework, these measures address the question: "If we succeed, how will we look to our shareholders?" (Kaplan & Norton, 2001b). As listed in Fig. 1, the measures in this study are among the most popular in a diverse set of industries (AICPA & Maisel, 2001).

They range from simple measures of output such as revenues and growth, to summary measures of profitability (gross margin, earnings before interest and taxes or EBIT, net operating income, and earnings per share or EPS) to comprehensive measures of profit vis-à-vis asset utilization (return-on-investment and economic value added), including also a popular liquidity measure (cash flows).

2.1.2. Use of Nonfinancial Measures

Nonfinancial performance measures are necessary to correct for several limitations inherent in financial measures: their short-term bias (which may lead managers to engage in myopic behavior, such as cutting down research and development or employee training expenses to achieve profitability targets); their high level of aggregation (which do not provide enough guidance to middle- or lower-level managers when choosing among alternative courses of action over factors they can control); and their historical focus (which do not capture improvements in quality, customer, or employee satisfaction that lead to future financial results).

Nonfinancial measures such as customer satisfaction correct for these limitations by promoting a more long-term focus (e.g., a sales manager in a car dealership aims at increasing long-term sales through improved customer satisfaction, as argued by Hemmer, 1996); by providing strategic priorities detailed for managers at all levels, based on factors they can control (Merchant & Van der Stede, 2007); and by helping to drive future performance (Ittner & Larcker, 1998b).

Nonfinancial measures are present in three perspectives of the BSC framework (Kaplan & Norton, 2001b): the customer perspective ("to achieve my vision, how must I look to my customers?"); the internal perspective ("to satisfy my customers, at which processes must I excel?"); and the learning and growth perspective ("to achieve my vision, how must my organization learn and improve?").

In our study (see Fig. 1), 10 of the most popular nonfinancial measures are included (AICPA & Maisel, 2001), encompassing the three nonfinancial BSC perspectives: customer services and satisfaction, and market share (customer perspective); quality and other process-related measures, innovation and new product development, operational time, speed and agility, and supplier, regulatory and compliance performance (internal business perspective); and productivity, employee turnover and demographics (learning and growth perspective).

2.1.3. Design Purposes

While the combination of financial and nonfinancial performance measures is not a new phenomenon (e.g., there is evidence of their use by General Electric in the 1950s, as cited in Kaplan & Norton, 2001b), a distinctive characteristic of SPMS implemented in the last two decades is an attempt to choose tailored performance measures that translate a particular organizational strategy into an integrated set of performance indicators. Thus, this set of measurements contribute to change management by fulfilling many purposes: not only to direct managerial action to the achievement of new strategic objectives, but also to provide feedback to managers, through a dynamic learning process, about the potential need for new strategy formulation (Simons, 1995). Thus, the particular purposes for which the SPMS are designed constitute a critical characteristic that determines its strategic outcomes (Chenhall, 2005). The importance of design for the ability of management control systems to mobilize change is clearly argued by Mouritsen (2005).

In the current study, the design purposes of the SPMS (as listed in Fig. 1) cover all four decision contexts described by Ittner and Larcker (2001): cost determination (e.g., measure business results); information for planning and control (e.g., evaluate individual performance, determine individual rewards and recognition, and communicate management directives); reduction of waste (e.g., manage operations, capital, and technology); and a strategic emphasis on value drivers (e.g., manage strategy, suppliers and customer relationship; communicate values and culture and support decision making). As highlighted by Ittner and Larcker (2001), SPMS research needs to clarify the purposes for which SPMS are used, since performance measures used for one purpose may not be used for other purposes, and the decision contexts for which the performance measures are designed are paramount when interpreting their outcomes.

2.2. SPMS Outcomes

In our model, we consider several desirable outcomes from SPMS implementation: information quality (are the SPMS providing high-quality information?), effectiveness (how effective are the SPMS?), and the degree of BSC adoption (to what extent have all cause-and-effect relationships of the BSC been articulated?).

2.2.1. Information Quality

Quality of information is a concept well defined in the information systems literature, and it relates to the value, usefulness or relative importance attributed to the information by its user (Bailey & Pearson, 1983; Rainer & Watson, 1995). Despite its subjective, perceptual nature, information quality has been consistently found to be positively associated with information system success, particularly increased use and effectiveness (Srinivasan, 1985). In the performance measurement literature, information quality has been found lacking for most performance measures except for short-term financial measures (Ittner & Larcker, 2001). For most performance measures, the perceived quality was rated much lower than the perceived importance of that measure. As Ittner and Larcker concluded, "studies investigating the internal use and benefits of these performance measures are incomplete without considering how well this information is measured" (2001, p. 384). A similar concern is expressed by Malina and Selto (2001) when examining why unreliable measures in the learning and growth perspective of an organization's BSC, fraught with low information quality, actually led this organization to drop the learning and growth perspective from its BSC altogether. Libby, Salterio, and Webb (2004) also found that higher information quality increases the chances that performance evaluators will use a more comprehensive set of unique and common performance measures in their evaluations. Kominis and Emmanuel's comprehensive study (2007) found, in fact, that the accuracy of performance measures significantly affects the value of extrinsic rewards, and the consequent motivation of managers.

Responding to these calls in the literature for more attention to information quality as an important outcome of SPMS, we have included it in our model to test its explanatory power of other SPMS outcomes and its direct and indirect effects on performance.

2.2.2. Effectiveness

SPMS effectiveness is closely related to information quality. In the information systems literature, higher information quality leads to system effectiveness, which comprises the increased use of the information, user satisfaction, and impact on the individual as well as the organization (DeLone & McLean, 1992). As catalysts of organizational change, more effective information systems have greater influence through a change in both recipient behavior and system performance (Mason & Mitroff, 1973). In the performance measurement literature (Malina & Selto, 2001), the BSC was found to be effective when it influenced motivation (employees feel that

they can control and influence their performance measures, and earn meaningful rewards and recognition) and promoted strategic alignment (a comprehensive yet parsimonious set of performance measures is causally linked to strategy, ultimately leading to improved organizational performance). Based on their extensive field research on the implementation of an effective BSC, Malina and Selto (2001) have concluded that effective management controls do not necessarily have a direct impact on performance; rather, effective management controls cause strategic alignment and effective motivation, which, in turn, cause performance improvements.

2.2.3. Degree of BSC Adoption

In addition to the two above-mentioned outcomes of the SPMS, information quality and effectiveness, in our model we also consider a third outcome, the degree of BSC adoption. This inclusion of degree of adoption of the BSC in our model follows admonitions by researchers "to devise improved methods for eliciting what firms mean by a 'balanced scorecard' and how this information is actually being used" (Ittner et al., 2003b, p. 739). Rather than simply comparing adopters with nonadopters of the BSC, for example, researchers need to probe deeper into the extent to which firms that claim to have implemented the BSC have, in fact, fully put into practice the recommendations by Kaplan and Norton (1996, 2001c).

As Chenhall (2005) noted, there is still limited evidence in the performance measurement literature about the number of organizations that have some form of SPMS, and even less research on the extent to which a more integrated form of SPMS such as the BSC is being used. On one side of the spectrum of degrees of BSC adoption, organizations have started to measure (besides accounting-based business performance, investments, and shareholder value) some combination of customer and process measures, but with a focus still on isolated key performance indicators (what Kaplan & Norton, 2001b, called "KPI scorecards"). On the other side of the spectrum, some organizations have fully deployed SPMS that are strategy-focused, comprising an integrated set of common and unique measures of performance linked through a series of cause-and-effect assumptions about how value is created.

As shown in Fig. 1, eight dimensions of the degree of BSC adoption are included in our model. Following Kaplan and Norton's BSC strategy map (2001b, Fig. 2, p. 92), we define the degree of BSC adoption as the extent to which SPMS have captured cause-and-effect relationships among the various sources of value creation, from investments to improve employee performance, compensation, reward and recognition, to technology infrastructure,

through strategic alliances with suppliers and customers, until capital investments translate into enhanced business performance and increased shareholder value. As noted by Atkinson (2001), these relationships among objectives related to customer, process, and learning and growth are decomposed or broken down and then integrated into the BSC framework in a way similar to how various operational measures were broken down and then integrated into the Dupont formula. A business unit implementing another form of SPMS that included a few, but not all, dimensions of the BSC framework, would rate low in the degree of BSC adoption scale in our study, rather than be considered simply an adopter or nonadopter.

In the practitioner-oriented performance measurement literature, several authors have also called attention to the importance of recognizing the different degrees of SPMS adoption (AICPA & Maisel, 2001; Tangen, 2005). Two potential explanations have been proposed to explain why organizations exhibit varying degrees of SPMS adoption: a cross-sectional explanation attributes different degrees of adoption to a "fit" argument (companies with more complex production technology, for example, tend to exhibit higher levels of SPMS integration and complexity to handle the information needs of managers); a time-series explanation recognizes that SPMS may evolve from existing, mostly financial-based SPMS and, as managers acquire more experience with performance measurement over time, SPMS move to a more balanced approach with the inclusion of nonfinancial measurements, up to the point when the organization adopts a fully integrated SPMS approach (Tangen, 2005).

2.3. SPMS Impact on Business Performance

Recent research on the performance effects of SPMS has established that characteristics and outcomes of the SPMS do not directly influence business performance; rather, through a complex set of cause-and-effect relationships, performance gains at different aspects of the business lead to improved overall performance (Bryant, Jones, & Widener, 2004). In our model, we evaluate how SPMS trigger organizational change by examining performance in two stages: first, the impact of SPMS on human resources practices, and second, on business results.

2.3.1. Impact on Human Resources
As depicted in Fig. 1, we identified six HR practices to gauge the impact of SPMS. Based on a review of the performance measurement literature,

we selected two areas mentioned by Kaplan and Norton (2001b) in which to assess the impact of SPMS on HR practices: alignment (through leadership, organizational structure, and control practices), and focus (HR initiatives to ensure the organization possesses the skill set necessary to implement the strategy: recruitment, training, and turnover).

Leadership is an essential ingredient to successful change management. As Kaplan and Norton point out, based on their decade-long experience with over 200 executive teams designing BSC programs, "ownership and active involvement of the executive team is the single most important condition for success" (Kaplan & Norton, 2001c, p. 155). With the organization's leaders mobilized for change, SPMS require new organizational structures and control practices to restructure work flows, develop new planning and control mechanisms, and assign new responsibilities to allow all of the organization's employees to use their capabilities to achieve the organization's objectives (Chenhall & Langfield-Smith, 1998).

When the existing skill set among current employees is not consistent with the requirements of the SPMS strategic programs, the organization engages in focused recruitment and training to acquire and develop strategic job-related skills, and allows turnover to resolve gaps between current skills and needed skills. This transformation in HR practices resulting from SPMS has, in fact, led to the emergence of terms like "HR scorecards" that track how well organizations have adapted their HR activities in response to the SPMS (Becker, Huselid, & Ulrich, 2001).

2.3.2. Impact on Business Results

As listed in Fig. 1, the SPMS impact on business results is reflected in changes in internal processes (research and development, product and service innovation, cycle time, process improvement programs, alliances and joint ventures), customer value (price, quality), and financial results (revenue growth, productivity), culminating in a reevaluation of the strategy itself. We purposefully selected a multidimensional approach for assessing the impact of SPMS on business results, to acknowledge that the SPMS are likely to influence many aspects of the organization, beyond just isolated financial results. Consistent with the findings by Mia and Chenhall (1994), managers that use a broad scope of information provided by the accounting system will exhibit stronger performance if differentiation of activities such as marketing is also present. As Bryant et al. (2004) revealed, the value-creation process in firms that adopt a BSC is best described by a model that allows for performance in each BSC perspective to be influenced by performance in all other BSC perspectives.

3. RESEARCH QUESTIONS AND HYPOTHESES

The hypotheses in this study stem from the following research question:

Does the strategic performance measurement system affect firm performance?

Following the path implied by the SPMS model, each variable is expected to be influenced by all the variables that preceded it. This procedure led to the formulation of the following hypotheses:

Hypothesis 1. The purposes for which the SPMS are designed are positively related to the use of performance measures.

Companies that use performance measures focused only on the financial dimension of performance (including revenues, net operating income, return-on-assets, or cash flow) will likely design the SPMS for traditional purposes such as measuring business results or evaluating individual performance. However, as evidenced in the literature, financial measures alone do not fully capture the impact of investments in firm-specific assets such as customer satisfaction or retention (Ittner & Larcker, 1998a). Companies that also use nonfinancial measures to track operational performance (including customer satisfaction, time, and new product development) will likely design the SPMS to be used for other purposes such as managing operations or customer relationships.

Hypothesis 2. The quality of the information provided by the SPMS is positively related to the use of performance measures and the design purposes of the SPMS.

As companies increase the scope of their performance measures and design the SPMS for a wide range of purposes, the quality of the information provided by the SPMS is expected to increase. With more dimensions of performance being measured, both financial and nonfinancial, managers can become more aware of the value of investments in intangible areas such as employee skills or product breakthroughs. Rather than treating such investments as simple period expenses, managers begin to see the reliability, timeliness, and accessibility of the information provided by the SPMS. As the measures become less aggregated and more detailed, leading to action, the perceived quality of the information is expected to increase. Similarly, in companies where the SPMS are designed for a wide range of purposes such as managing technology, managing operations, or determining awards, the demands placed on the SPMS to deliver high-quality information increase, so users are expected to rate the quality of information more highly.

Hypothesis 3. The effectiveness of SPMS is positively related to information quality, the design purposes of the SPMS, and the use of performance measures.

SPMS are more likely to be effective – leading to increased use of the information, user satisfaction, and achievement of objectives – when the information quality provided by those systems is higher, as discussed in the previous section of this paper. In companies where SPMS are designed for traditional as well as strategic purposes, motivation and strategic alignment improve, translating into more effective SPMS (Malina & Selto, 2001). As companies implement an integrated set of performance measures, SPMS are capable of providing ''feedback on how business activities link to strategies and to various aspects of the value chain'' (Chenhall, 2005, p. 400), thus increasing the effectiveness of the SPMS (Vitale & Mavrinac, 1995).

Hypothesis 4. The degree of BSC adoption is positively related to the information quality and effectiveness of SPMS, their design purposes, and the use of performance measures.

The degree of BSC adoption refers to the extent to which the company actually deploys the SPMS for strategic purposes while maintaining an integrated set of performance measures that exhibit strong cause-and-effect relationships with various dimensions of performance. Where SPMS effectiveness and information quality are high, the organization is better equipped to actually adopt the BSC as a strategic management tool because SPMS effectively link strategic objectives to actionable metrics, helping managers focus on the critical success factors required by the strategy. If the company designed the SPMS for traditional as well as strategic purposes, it is more likely to adopt a BSC that will fully assist managers in planning, controlling, learning, and adapting the strategy based on the feedback provided by the cause-and-effect relationships found in the BSC. The use of the appropriate mix of financial and nonfinancial performance measures provides managers with the necessary information to fully adopt and implement the BSC.

Hypothesis 5. The impact of SPMS on HR practices is positively related to the degree of BSC adoption, the effectiveness and information quality of SPMS, their design purposes, and the use of performance measures.

As companies extend their actual degree of adoption of SPMS for truly strategic purposes (implementing a BSC framework), the newly articulated strategies and the SPMS are expected to mobilize the organization's human

resources to value creation. In particular, the BSC promotes alignment and focus, influencing the organization's leadership, organizational structure, control practices, and the HR initiatives aimed at improving the skill sets of employees (Becker et al., 2001). For example, a company that consistently tracks employee skills needed versus skills available to execute the strategy through its BSC will be better prepared to invest in training programs that actually target skills that are critical for implementing organizational strategy. Similarly, organizations that have more effective and high-quality-information SPMS alert their managers to what changes in high-performance work practices (Huselid, 1995) are necessary to execute the strategies. As the purposes for which the SPMS are designed expand to include a strategic emphasis on value drivers, the SPMS create a need for new HR initiatives to promote strategic alignment (through leadership, changes in structure and control practices) and to ensure that current and potential employees have the knowledge and skills (through recruiting, training, and turnover) to act in ways consistent with the newly articulated strategic priorities. The use of performance measures that capture both the financial and nonfinancial dimensions of performance is also expected to influence HR practices, as gaps in performance make evident the need for reallocating authority or acquiring new employee skills.

Hypothesis 6. The impact of SPMS on business results is positively related to the impact of SPMS on human resources, the degree of BSC adoption, the effectiveness and information quality of SPMS, their design purposes, and the use of performance measures.

When SPMS enable the firm's human resources to contribute to value creation through strategic initiatives, the full potential of human capital is realized and translated into business results. In fact, HR practices, when aligned with the firm's competitive strategy (external fit), can become a source of sustained competitive advantage and promote synergies among all processes for acquisition and development of the firm's human capital (internal fit), leading to improved business results (Huselid, 1995). By measuring the strategic role of human resources in the BSC, firms that have fully adopted the BSC can align employee performance improvements at the individual level with improvements in business results at the firm level. A fully implemented BSC mobilizes existing resources (e.g., people, technology, relations with customers) to the achievement of the newly articulated strategies. As Kaplan and Norton (2001b) highlighted, it is not a new product or a new group of employees that explain the performance

gains realized by companies soon after successfully implementing the BSC; rather, those gains are explained by the implementation of the BSC. Thus, we also expect in our model that the degree of BSC adoption will positively influence business results.

Effective and high-quality-information SPMS, by focusing attention on strategic priorities, facilitating communication across functions and departments within the firm, and promoting action that is consistent with organizational goals, should also contribute to the impact of SPMS on business results. As companies design the SPMS to make the strategy more transparent and meaningful to employees, and include purposes for the SPMS such as managing strategy or supporting relationships with customers and suppliers, the linkages between strategy and daily tasks become more visible, facilitating coordination and learning, thus improving business results. In companies where managers have more information from a wide range of performance measures available to make decisions that impact future performance, managers have more confidence that they are managing all critical areas of the business, so the impact of the SPMS on business results is expected to be stronger (see, e.g., evidence by Ittner & Larcker, 1998a, relating customer satisfaction performance to future accounting performance).

4. RESEARCH METHODS

4.1. The Survey

Data for this research were obtained from the American Institute of Certified Public Accountants, based on the Performance Measurement Practices Survey (AICPA & Maisel, 2001). The large sample ($N = 1,990$) includes every industry in the Dow Jones Global Industry Groups classification.

4.2. Measurement of the Variables

All items included in the measurement of variables are listed in Fig. 1. Financial and nonfinancial measures consisted of 9 and 10 items, respectively, to which participants were asked whether the respondent's business unit used that measure to evaluate business unit performance.

The other variables were measured on a five-point Likert scale to show the extent to which each item was applicable to the respondent's business unit (see Fig. 1 for details):

- design purposes: 12 items dealing with purposes for the SPMS (1 = not used, 5 = extensively used);
- information quality and effectiveness: one item each (1 = poor, 5 = excellent);
- degree of BSC adoption: eight items pertaining to dimensions of the business on which the SPMS had a cause-and-effect relationship (1 = no effect, 5 = significant effect);
- impact on HRs and business results: 6 items listing HR practices, and 10 items listing aspects of the business (1 = no effect, 5 = significant effect).

Table 1 shows descriptive statistics for the eight variables used in this study. The number of observations varies due to missing values in questionnaires that were returned with incomplete answers. Still, at least 1,680 answers were obtained for the eight variables. For the six variables that encompass multiple items, Cronbach alphas are at or above 60%, suggesting relatively high reliability and ensuring that these variables form internally consistent scales. The correlation matrix among the eight variables appears in Table 2, indicating that all coefficients were significant at the 0.001 level. Consistent with arguments in the performance measurement literature (Hemmer, 1996; Bento & White, 2006), we found a significant correlation between the use of financial and nonfinancial measures, suggesting that sample companies strive to balance traditional metrics that track past performance with the use of future-oriented performance indicators.

Table 1. Descriptive Statistics.

	Mean	Standard Deviation	N
Financial measures	13.1	1.9	1,925
Nonfinancial measures	13.3	1.9	1,913
Design purposes	38.6	8.9	1,867
Information quality	2.9	0.8	1,808
Effectiveness	3.1	0.9	1,876
Degree of BSC adoption	24.6	5.7	1,749
Impact on human resources	17.2	4.8	1,800
Impact on business results	28.9	7.4	1,680

Table 2. Correlation Matrix of SPMS Variables.

	1	2	3	4	5	6	7	8
1. Financial measures	–	0.415	0.224	0.094	0.085	0.215	0.131	0.209
2. Nonfinancial measures		–	0.387	0.180	0.282	0.335	0.313	0.410
3. Design purposes			–	0.402	0.619	0.643	0.576	0.650
4. Information quality				–	0.546	0.333	0.291	0.360
5. Effectiveness					–	0.483	0.456	0.517
6. Degree of BSC adoption						–	0.650	0.758
7. Impact on human resources							–	0.667
8. Impact on business results								–

Note: All significant at 0.001.

4.3. Data Analysis

We performed path analysis to determine the relationships among the variables described in Fig. 1. We tested whether SPMS characteristics affected SPMS outcomes and which SPMS characteristics and outcomes had a direct or indirect impact on performance (on HR practices and on business results). This technique helped us to investigate not only the relationships within each set of variables but also to compare the relative magnitude of the relationships among sets of variables.

Stepwise regression analyses were performed to determine the path coefficients for the relationships among the variables proposed in the model for this study. Each dependent variable was regressed on all variables that preceded it in the model, according to the hypotheses developed in the previous section. Beta weights or path coefficients are reported instead of partial correlations (regression coefficients) because the beta weights indicate the extent to which a change in the dependent variable is produced by a standardized change in one of the independent variables, after controlling for the other independent variables (Blalock, 1979). Path analysis was selected for this study because it explicitly uses existing theory and the hypothesized relationships among the variables to test the strength of those relationships. Path analysis does not require the same limiting assumptions about the type of data and statistical distributions that other approaches require, so it better fits the type of perceptual, ordinal data found in this survey (Bento & Bento, 2004; Simon, 1954).

5. RESULTS

As shown in the path analysis diagram in Fig. 2, the significant and positive path coefficients provide empirical support for our strategic performance measurement model:

5.1. Hypothesis 1

We found a significant direct effect of the use of nonfinancial measures on the purposes for which SPMS are designed, lending support for Hypothesis 1. The effect of the use of financial measures on design purposes is only indirect, through its influence on the use of nonfinancial measures, suggesting that it is the extent to which nonfinancial measures are used that mostly determines the purposes of the SPMS.
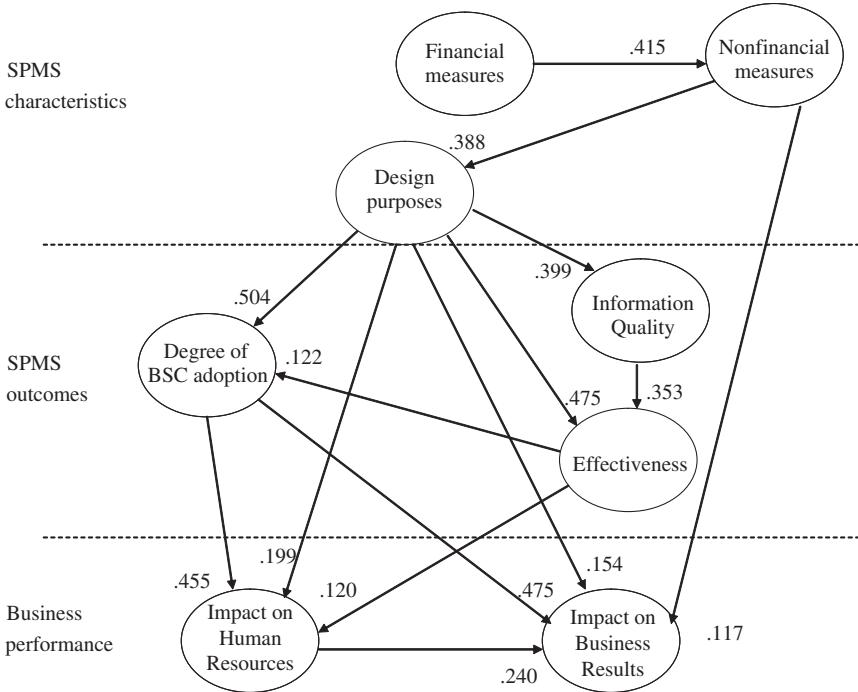
Fig. 2. Results.

5.2. Hypothesis 2

SPMS design purposes have a significant and positive effect on information quality, consistent with Hypothesis 2. Companies that emphasize design purposes ranging from measuring business results to managing suppliers tend to implement SPMS perceived to be of higher quality. We found only indirect effects of the use of financial and nonfinancial measures on information quality.

5.3. Hypothesis 3

Both information quality and design purposes have significant effects on SPMS effectiveness, in support of Hypothesis 3. The performance measures used have only an indirect effect on effectiveness, through their influence on design purposes.

5.4. Hypothesis 4

The degree of BSC adoption is influenced by design purposes and effectiveness, as predicted in Hypothesis 4. The purposes for which SPMS are designed have a much stronger effect than SPMS effectiveness on the extent to which the BSC is actually adopted in practice, after controlling for other factors such as information quality, and the use of financial and nonfinancial measures. This finding is consistent with claims in the literature that it is the various purposes for which the SPMS are designed that determine if the BSC is actually fully adopted (Ittner & Larcker, 2001).

5.5. Hypothesis 5

The impact of SPMS on HR practices such as employee recruitment and turnover is mostly influenced by the degree of BSC adoption, followed by the direct influences of SPMS design purpose and effectiveness. In companies where the SPMS are designed for more strategic purposes, SPMS are perceived as more effective and the BSC is actually fully adopted, with a noticeable impact on human resources. We found no direct effects of information quality or the use of financial and nonfinancial measures on human resources: it appears that information quality and performance

measures have only an indirect effect on HR practices, through their
relationships with design purposes and effectiveness.

Therefore, regardless of the type of performance measures used, or
whether managers consider that the SPMS provide high-quality informa-
tion, companies that do not limit the SPMS to traditional purposes (such as
measuring business and individual results) but also deploy the SPMS in
nontraditional ways – to communicate values and culture, and management
directives, while adopting the BSC to its full extent by maintaining strong
cause-and-effect linkages between the SPMS and customers, shareholder
value, technology infrastructure, and employee performance – reap stronger
benefits from their SPMS in terms of improved HR practices.

5.6. Hypothesis 6

HR practices, in turn, along with degree of BSC adoption, and two SPMS
characteristics, design purposes and the use of nonfinancial measures, lead
companies to enjoy the full payback of SPMS implementation, measured as
the impact of the SPMS on business results (Hypothesis 6). The direct effects
of SPMS design purposes and degree of BSC adoption on performance
are even more pronounced than the effects of information quality and
effectiveness on performance.

Interestingly, when we tested for the direct relationships of the use of
individual nonfinancial measures with the impact on business results, while
controlling for the other variables in the model, the relationships were
much weaker. This result supports the assertion from prior research that
it is the use of a whole integrated set of nonfinancial measures, instead
of the isolated use of one or two measures, that drives SPMS impact on
performance (Chenhall, 2005). In our study, we show that this effect of the
use of nonfinancial measures on business results is both direct and indirect,
through its influence on the purposes for which SPMS are designed.

An examination of the path coefficients in Fig. 2 reveals that the degree
of BSC adoption (which is heavily influenced by design purposes) has
a stronger, *direct* effect on business results than any other variable in our
model. Furthermore, the degree of BSC adoption also has an *indirect* impact
on business results, through its strong and positive influence on how SPMS
impact HR practices. Combining the direct (47.5%) and indirect (11% =
45.5% × 24%) effects of degree of BSC adoption on business results, it
appears that the degree of BSC adoption is the single most important factor
in our model, explaining more than half (47.5% + 11% = 58.5%) of the

variation in the impact of the SPMS on business performance, influencing critical business results such as business strategy, productivity, revenue growth, operating quality, and process improvement programs.

Using the path coefficients from Fig. 2, a similar analysis can be performed of the *direct* (15.4%) and *indirect* effects of design purposes on business results, by estimating the influence of design purposes on human resources and, in turn, HR impact on business results (19.9% × 24% = 4.8%), plus the influence of design purposes on BSC adoption and, in turn, BSC adoption's direct (50.4% × 47.5% = 23.9%) and indirect (50.4% × 45.5% × 24.4% = 5.5%) impact on business results, resulting in design purposes explaining a total of almost half (15.4% + 4.8% + 23.9% + 5.5% = 49.6%) of the variation in the impact on business results.

These findings help explain the conflicting results of Niraj, Foster, Gupta, and Narasimhan (2008) and Ittner and Larcker (1998a), who tested for the direct effects of isolated nonfinancial measures on various performance dimensions. Our findings suggest that, beyond the simple use of nonfinancial measures, the full adoption of the BSC, along with the improvements in HR practices triggered by the SPMS, consistent with a wide range of SPMS purposes, set in motion a complete value-creation cycle of planning, measuring, controlling, rewarding, and re-evaluating the strategy.

6. SUMMARY AND CONCLUSIONS

This study was designed to address the general question of whether SPMS have a significant impact on firm performance. Our empirical results, based on data from 1,990 organizations, from a wide range of industries, suggest that the answer is yes, justifying the significant resources (both human and financial) firms have deployed for the design and implementation of SPMS. Thus, our study contributes to the more recent SPMS literature (which we coined the "so-what" literature) by providing empirical evidence in support of the positive effects of SPMS.

According to the regression results summarized in Table 3, the impact of the SPMS on business results is explained by four main factors: degree of BSC adoption, impact on HRs, design purposes, and the use of nonfinancial measures. Together these four factors account for 68% of the variation in the impact on business results. Among those relevant factors, the degree of BSC adoption is clearly the most significant.

Those results both confirm and expand on the existing SPMS literature. Consistent with previous studies (Banker et al., 2000; Bento & White, 2006),

Table 3. Regression Results.

Dependent Variable	Independent Variables	β	$\bar{R}^2$	Significance
Impact on business results			0.68	0.0001
	Degree of BSC adoption	0.475		
	Impact on human resources	0.240		
	Design purposes	0.154		
	Nonfinancial measures	0.117		
Impact on human resources			0.46	0.0001
	Degree of BSC adoption	0.455		
	Design purposes	0.199		
	Effectiveness	0.120		
Degree of BSC adoption			0.42	0.0001
	Design purposes	0.504		
	Effectiveness	0.122		
Effectiveness			0.48	0.0001
	Design purposes	0.475		
	Information quality	0.353		
Information quality	Design purposes	0.399	0.16	0.0001
Design purposes	Nonfinancial measures	0.388	0.15	0.0001
Nonfinancial measures	Financial measures	0.415	0.17	0.0001

our model shows the positive association between the use of nonfinancial measures and performance. Also consistent with prior BSC research, our finding that the impact of the SPMS on HR practices is positively associated with improved business results reinforces the BSC framework, illustrating linkages between the learning and growth perspective with the other BSC perspectives. Our results further show that 46% of the impact of the SPMS on HR practices is determined mainly by the degree of BSC adoption, followed by design purposes, and effectiveness.

Expanding on the existing SPMS literature, we introduced two new variables in our model, the degree of BSC adoption and design purposes, which are both among the top three most significant factors in explaining the impact of SPMS on performance. The degree of BSC adoption has the strongest direct effects on the impact of the SPMS on human resources and business results. Design purposes emerges as a critical variable in our model, since it is the single most important factor in explaining all three SPMS outcomes examined in this study – information quality, effectiveness, and the degree of BSC adoption – and it influences both forms of the SPMS impact on performance.

Future research in performance measurement may further investigate which factors determine the two new variables we introduced here, degree of

BSC adoption and design purposes. Our model offers initial insights into which variables lead to a higher degree of BSC adoption. We found that the degree of BSC adoption is mainly influenced by design purposes and effectiveness; these two variables alone explain 42% of the variation in the degree of BSC adoption. The design purposes variable, in turn, is significantly influenced by the use of nonfinancial measures. However, given the relatively low adjusted R^2 (15%) for design purposes, additional studies will be needed to identify which other variables not in our model best explain cross-sectional differences in design purposes.

Our study also integrates variables from the literatures within two closely related functional areas: the performance measurement literature (concerned with SPMS and its performance effects) and the information systems literature (concerned with information quality and effectiveness). We found that effectiveness, which is the second most important SPMS outcome in influencing the SPMS impact on human resources, is significantly explained by design purposes and information quality (adjusted $R^2 = 48\%$).

Our results suggest that future researchers can provide a valuable contribution to the SPMS literature by investigating what other factors interact with the SPMS characteristics and outcomes presented here to yield performance results. In this study the impact on business results variable included financial and nonfinancial dimensions of performance, improving upon previous studies that focused only on stock market performance (Ittner et al., 2003b). Future research could test alternative specifications of the model proposed in Fig. 2, and use model fit statistics to verify which model is superior in explaining SPMS outcomes and impact on performance.

Furthermore, the extent to which the perceived impact on business results reported by the respondents in this study actually translates, over time, into accounting-based or stock-based performance remains an interesting empirical question. We intend to pursue this question in a follow-up study using archival data to address some of the limitations of the perceptual data obtained through this survey.

By providing additional empirical evidence that SPMS impact performance, we hope to have also informed practitioners in charge of designing and implementing SPMS about some factors deserving of their attention. Our findings imply that design purposes and degree of BSC adoption are, indeed, important for the impact of the SPMS on business results; as such, we propose that they should not be simply delegated to finance or accounting professionals, but require full participation by the whole management team.

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SERVICE QUALITY, SERVICE RECOVERY, AND FINANCIAL PERFORMANCE: AN ANALYSIS OF THE US AIRLINE INDUSTRY

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ABSTRACT

This study on the airline industry covers the period from 1990 to 2006 and finds that "complaints" is a leading indicator of future financial performance as measured by return on sales (ROS) one-quarter ahead. Results also indicate that this effect persists into longer-term future performance (i.e., the average of one-quarter and two-quarter-ahead) as measured by return on assets (ROA) and ROS. Findings also indicate that service recovery effort in reducing mishandled baggage, is associated with higher future financial performance as measured by one-quarter-ahead ROA. Similarly, service recovery efforts, in reducing mishandled baggage and complaints, are found to be associated with both short-term and longer-term future financial performance as measured by ROA or ROS. Nevertheless, this relationship diminishes when flights have a higher "load factor" (or higher enplanements). Literature on service operations states that although service failure (such as flight cancellations, delays,

*misconnections, mishandled baggage, or over boarding) can negatively
affect customer repurchase intentions, employees' ability to diagnose and
respond to problems at the critical moment can overcome negative effects
of a service failure. This suggests that management should consider
having trained frontline employees and flight attendants provide comfort,
assurance, empathy, support, and assistance to customers following
service failures. This should help to enhance repurchase behavior and
brand loyalty thereby improving future financial performance.*

INTRODUCTION

Proponents of the balanced scorecard argue that improvement in areas such
as customer satisfaction, quality, employee satisfaction, innovation, or
growth represent investments in firm-specific assets that are not fully
captured in current accounting measures. Thus, they suggest that investment
in these ''intangible'' assets may be better predictors of future financial
performance than historical accounting measures, suggesting that non-
financial measures should supplement financial measures in internal
accounting systems (Kaplan & Norton, 1996, 2004). Likewise, accounting
policymakers have suggested that financial statement users be provided with
nonfinancial performance information that may increase their ability to
evaluate and predict financial performance (AICPA, 1994; Francis &
Schipper, 1999; FASB, 2001; Lev, 2001; Maines et al., 2002). In particular,
nonfinancial performance measures with forward-looking properties are
considered desirable because these performance measures should lead to a
more efficient allocation of resources for managers, investors, and creditors
as their decisions are based on the expectations of future rewards.

Several accounting researchers have examined the predictive ability and
value relevance of nonfinancial performance measures such as customer
satisfaction on firms' future performance (Dresner & Xu, 1995; Ittner &
Larcker, 1998; Behn & Riley, 1999; Lambert, 1999; Riley, Pearson, &
Trompeter, 2003). Few studies in accounting, however, have linked
customer complaints to future financial performance. The marketing
literature has shown that complaints are a manifestation of dissatisfaction.
There is also evidence that many disgruntled customers do not complain to
service providers directly but engage in less visible behavior such as making
negative comments to others. Thus, some businesses may lose 10–15% of
their annual sales volume each year because of poor service (Harari, 1992;

Singh, 1990; Blodgett, Granbois, & Walters, 1993). Accordingly, Anderson, Pearo, and Widener (2008) suggest ''dissatisfaction is not simply the absence of satisfaction'' and their results show that the drivers of satisfaction differ from the drivers of dissatisfaction.

More recently, the airline industry has undergone tremendous changes, which calls for an urgency to look into issues such as complaints. A document released by The Federal Aviation Administration in 1999 predicts that passenger demand or customer service will be an increasing important determinant of the growth of large airlines.[1] In less than 5 years, the above prediction has been questioned or challenged (see Belobaba, 2005). Most notably, recent studies of the airline industry conducted by the Sloan Foundation's Industry Studies Program and MIT Airline Industry Consortium assert that the US airline industry is in the midst of its greatest transition in history. One study states that ''the problems that began with the economic downturn at the beginning of 2001 reached almost catastrophic proportions after September 11, 2001.'' In the United States alone, the industry posted cumulative net losses of over $40 billion from 2001 to 2005, and only in 2006 was it able to return to the black with an overall net profit.[2] A comprehensive research study conducted by scientists in the MIT Global Airline Industry Program suggests that revenue power of major airlines has disintegrated with little relation to the events of September 11, 2001 (Belobaba, 2005). They show that between the years 2001 and 2004, price cuts to stimulate leisure demand led to record load factors but they do not improve revenue quality. Among other things, the study suggests that business passengers are no longer willing to pay 5–8 times the lowest available fare. In addition, ''cutbacks'' seem to have reduced service quality differences between major air carriers and low-cost carriers. Given the revenue shortfall, despite recovery of traffic and load factors, Belobaba (2005) suggests that ''legacy'' airlines must cut costs and increase productivity such as seating density and aircraft ground turnaround times (also known as aircraft productivity). Given the changes, partly due to the inherent economic factors, such as soaring fuel cost, intense competitive pressure from the low-cost carriers, problems with the air transportation system's reliability, and operating performance, more research studies should be undertaken in the airline industry as previous research models may no longer be relevant. This research examines the interrelationship of some nonfinancial performance variables (such as on-time arrivals, mishandled baggage, complaints, and aircraft productivity) and their effects on future profitability in the airline industry during the period 1990–2006.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The airline industry is a mature capital-intensive industry characterized by significant operating costs (e.g., maintenance, fuel, and labor), low margins, and relatively large off-balance-sheet liabilities from leased aircrafts. The 1978 deregulation in the airline industry removed the shields that protected airlines from market competition and environmental uncertainty such as economic downturn, terrorist attack, and increase in fuel prices. Thus, major airlines have focused on increasing operating efficiency and decreasing costs as primary business strategies to increase profits, particularly during the 1990–1994 downturns in the industry. Also, effective utilization of capacity and price elasticity has often been cited as important determinants for competition.

Service Quality

Schefczyk (1993) has shown that accounting information in the airline industry is relatively noisy for explaining future growth opportunities. In a study of the airline industry, Riley et al. (2003) reported that nonfinancial performance variables exhibit incremental relevance over and above traditional accounting metrics. Critiques have attributed these findings to the capital-intensive nature of the airline industry.[3] Thus, when comparing performance among airlines, financial analysts, regulators, and the media often use operating measures or non-accounting measures (e.g. number of complaints, on-time arrivals, mishandled baggage, etc.) gathered by the Department of Transportation (DOT).

Customer Retention, Customer Satisfaction, and Complaints
Research has shown that customer satisfaction is an antecedent of increased market share, profitability, positive word-of-mouth, and customer retention (Fornell, 1992; Anderson, Fornell, & Lehman, 1994; Ittner & Larcker, 1998). Likewise, prior studies support the notion that customer satisfaction is a useful supplement to financial performance measures because it captures elements of value not reflected in historical accounting-based measures (Lev, 2001; Maines et al., 2002). Similarly, proponents of balanced scorecards suggest that customer-related measures are useful supplements to financial performance. Specifically, customer-related measures such as customer retention, customer satisfaction, or complaints are lead indicators

of long-term future measures of financial profitability (Kaplan & Norton, 1996, 2004).

It is generally assumed that satisfied customers will continue to return. Thus, higher service quality (e.g., on-time arrivals) will positively affect current and future sales revenue. On the other hand, lower service quality or complaints (may be related to flight delays, mishandled baggage, and other causes of dissatisfaction) will negatively affect current and future sales revenue. Marketing research, however, suggests that customer satisfaction does not necessarily generate a significant increase in contemporaneous revenues, that is, customer satisfaction in some retail settings has been shown to have negative contemporaneous consequences while unhappy customers appear to be associated with lost revenue (Anderson, Fornell, Lehman, & Mittal, 2000). This suggests that the forward-looking properties of negative customer satisfaction (such as flight delays, mishandled baggage, or passenger complaints) on future profitability might be stronger than attributes of positive customer satisfaction. On the other hand, the attractiveness of some reward travel programs (e.g., frequent mileage or executive clubs) offered by various airlines may provide incentives for passengers to continue their patronage despite negative traveling experiences. For example, United Airlines announced that it will give 500 miles to passengers delayed by at least 30 min on flights to and from O'Hare International Airport and seven destinations within North America.[4] So, it is logical to assume that the attractiveness of the executive clubs or frequent mileage programs, may entice "unhappy customers" to continue their travel with the same airlines in order to accumulate mileage or take advantage of other "perks." Furthermore, except for passenger complaints, other customer service indicators (e.g., on-time arrivals and mishandled baggage) were self-reported by individual airlines which lead to the question of "reliability." Thus, within the airline industry, it is unclear how negative customer satisfaction or complaints will affect the passengers' future choice of air travel. Accordingly, the following hypothesis is tested:

H1. Higher service quality (measured by complaints) will positively affect airlines' future financial performance.

Service Failure and Service Recovery

The marketing literature has also documented that service failures provide an opportunity for service recovery, thereby turning angry, frustrated

customers into loyal ones. Alternatively, service failure followed by poor service recovery leads to customer dissatisfaction, and dissatisfied customers may engage in negative word-of-mouth behavior. Bitner, Booms, and Tetreault (1990, p. 80) found that "it is not the initial failure to deliver the core service alone that causes dissatisfaction, but rather the employees' response to failure." Indeed, Bitner et al. (1990) found that a positive and appropriate response from an employee can overcome negative effects of a service failure. Similarly, Kelly, Hoffman, and Davis (1993) assert that regardless of the type of service failure experienced, customers will return provided that an effective service recovery is executed. For example, after reporting problems with mishandled baggage or complaints with the service providers, customers will pay close attention to airlines' recovery efforts. Consequently, it is expected that variation in service recovery efforts across major airlines may affect travelers' "repeat purchase" decisions, which in turn affect their future financial performance. Thus, the following hypothesis is formulated:

H2. Positive service recovery efforts by airlines will have a positive effect on future financial performance.

Aircraft Productivity

Aircraft productivity is a measure of capacity utilization. It is measured in terms of the number of hours that an aircraft is considered to be in a revenue-producing mode. Since airplanes represent capital-intensive equipment, the extent to which they are utilized should affect financial performance. For example, the gains from reducing gate time by just 5 min per departure are substantial for Southwest Airlines (Gittell, 2003). Indeed, research has shown that aircraft productivity is positively related to operating margin (Gittell, Nordenflycht, & Kochan, 2004; Gittell, 2001). On the other hand, improving quick turnaround time can be counterproductive, if not done properly. For example, with improved employee productivity and coordination, "Continental Lite" achieved a shorter turnaround time in 1994. Nevertheless, on-time performance dropped and customer complaints mounted which led to the repositioning of Continental as a hub-and-spoke carrier again by early 1995 (Gittell, 2003, p. 216). This suggests that improving aircraft productivity without improving or sustaining service quality may lead to lower customer satisfactions or higher service failures, which in turn could affect the profitability of an airline.

Although aircraft productivity (asset utilization) is related to how flights are scheduled, it is also greatly influenced by the extent to which employees cooperate, coordinate, and exert discretionary effort in getting planes loaded and turned around quickly. For example, quick turnarounds at the gate are impossible without a high level of coordination among several different employees: pilots, flight attendants, gate agents, ticketing agents, operations agents, ramp agents, baggage-transfer agents, cargo agents, mechanics, fuelers, aircraft cleaners, and caterers (Gittell, 2003, p. 22). Research studies have shown that when tasks are highly interdependent, as in the case of on-time departure and on-time arrival, rewards for improving firm-level performance are sufficient to prompt the choice of "high effort" by each member to achieve the desired goals; consequently, slack is minimized (Holmstrom, 1982). For example, when Continental Airlines reported losses from 1992 to 1994, it averaged last among the 10 major domestic airlines on on-time arrivals, baggage handling, and customer complaints. In an effort to avoid its demise, on January 15, 1995, Continental Airlines promised $65 to all 35,000 hourly employees for every month that its on-time performance ranked among the top five in the industry. The program began in February 1995 and continued unchanged until December of the same year. In 1996, the bonus plans were modified to pay $65 for the months in which Continental Airlines ranked second or third in on-time arrival and $100 when it ranked first. There were instances where employees were being summoned from break rooms or being chastised for leaving their stations by their peers; gate agents were getting into aircraft holds to identify and help overcome sources of delay. In addition, gate and ramp employees directly confronted pilots who were causing delays. These changes[5] and "high effort" by the employees helped Continental report a net profit of $224 million in 1995. Net profit grew to $319 million in 1996 and $385 million in 1997 and was accompanied with large operational cash surpluses (Knez & Simester, 2001).

Given the interdependence between aircraft productivity and service quality, when the frontline employees switch into a "high effort" mode, it is likely that aircraft productivity will be higher, flights will more likely depart as scheduled and arrive on time; mishandled baggage will be minimized and the number of complaints is likely to be lower. It is expected that this combined effect will elevate a firm's operating performance. Accordingly, the following hypothesis is formulated:

H3. Service quality (measured by complaints) and aircraft productivity will jointly affect airlines' future financial performance.

RESEARCH METHODS

Antecedents of Complaints

As noted earlier, "complaints" is one of the explanatory variables explaining future financial performance. However, it is generally agreed that "complaints" do not happen in isolation. Using information compiled by DOT and reported in *Air Travel Consumer Report*, the top two reasons for complaints are flight-related problems (cancellations, delays, or misconnection) and mishandled baggage (see Appendices A and B). Together, they represent about 40–50% of complaints filed. Other variables which potentially may affect "complaints" should also be considered. They include occupancy rate (known as load factor) and aircraft capacity (known as aircraft productivity). To correct for potential endogeneity bias, on-time arrivals, mishandled baggage, load factor, and aircraft productivity were included in a two-stage least squares (2SLS) regression as explained below.[6]

The Research Model

To answer our research questions, we use a 2SLS fixed-effect panel data regression. The model is described as follows:

$$\begin{aligned} \text{Perf}_{i,q+1} = \beta_0 &+ \beta_1 \text{ complaints}_{iq}, + \beta_2 \%\Delta \text{ in complaints}_{iq} \\ &+ \beta_3 \%\Delta \text{ in mishandled baggage}_{iq}, \\ &+ \beta_4 \text{ load factor}_{iq} \times \Delta \text{ mishandled baggage}_{iq} \\ &+ \beta_5 \text{ load factor}_{iq} \times \Delta \text{ complaints}_{iq} + \beta_6 \text{ aircraft productivity}_{iq} \\ &\times \text{ complaints}_{iq} + \text{Perf}_{iq} + \sum \text{ year dummies}_t + \delta_i + \varepsilon_{iq} \end{aligned}$$

Where:

1. $\text{Perf}_{i,q+1}$ is one-quarter-ahead return on assets (ROA) or return on sales (ROS) for firm i. Longer-term future performance $[(\text{Perf}_{i,q+1} + \text{Perf}_{i,\,q+2})/2]$ is also tested. For all models $i = 1, \ldots, N$; $q = 1, \ldots, Q$, with $N = 10$ airlines and $Q = 72$ quarters.
2. Surrogates for service recovery: (i) $\%\Delta$ in mishandled baggage (ii) $\%\Delta$ in complaints, calculated as: $\%\Delta$ Complaint$_q$ = [Complaint$_q$ − Complaint$_{(q-4)}$/Complaints$_{(q-4)}$] × 100; $\%\Delta$ in mishandled baggage is calculated in the same way. Note that (load factor$_{iq}$ × Δ mishandled

baggage$_{iq}$) and (load factor$_{iq}$ × Δ complaints$_{iq}$) are included to capture the moderating effect of load factor on service recovery effort as discussed in the next section.

3. Control variables are Perf$_{iq}$ and $\sum$ year dummies$_t$, where t consists of years 1991–2006 (i.e., year 1990 is coded as the constant).

4. The four antecedents for complaints and introduced in stage one least squares are aircraft productivity$_{iq}$, load factor$_{iq}$, on-time arrival$_{iq}$, and mishandled baggage$_{iq}$.

5. δ_i is the unobserved firm's fixed effect.

6. ε_{iq} is the error term.

Methodology

The data used in this study consist of information on 10 major domestic airlines over the period starting with the 1st quarter of 1990 and ended with the 4th quarter of 2006 for a total of 72 quarters per airline. Note that, Trans World Airlines (TWA) ceased operations in 2001 and America West merged with US Airways in the middle of 2005. Beginning in 1987, the Federal Government has mandated that performance statistics such as mishandled baggage, on-time arrivals, flight delays, ticket oversales, and consumer complaints be reported to the USDOT for the major carriers in the US airline industry. This information is reported and published monthly in the *Air Travel Consumer Report* (*ATCR*) by the Office of Consumer Affairs (a division of DOT). The reports, compiled by DOT, were generated using Uniform System of Accounts, which provides operating information of major airlines in the United States since 1987. Except for consumer complaints, which were filed by unhappy customers directly to DOT, all data were collected by individual airlines and reported to DOT. Financial data such as ROA and ROS were collected from Compustat.

Measure

On-Time Arrival, Mishandled Baggage, Complaints
These three measures were extracted from the *Air Travel Consumer Report*. They include percent of reported flight operations arriving within 15 min of the scheduled time shown in the airline's computerized reservation system (on-time arrivals), mishandled baggage per thousand passengers, and consumer complaints per 100,000 passengers.

Service Recovery (Percent Change in Mishandled Baggage, Percent Change in Complaints)

As previously discussed, service recovery literature documented that service failures provide an opportunity for service recovery, thereby turning angry and frustrated customers into loyal ones. Thus, percent change in mishandled baggage and percent change in complaints are used as surrogates for service recovery. A reduction in these numbers compared to the same quarter of the previous year indicates positive service recovery effort, and vice versa. Note that load factor (i.e., low or high enplanement) may affect service quality (boarding, on-time departure, on-time arrivals, or complaints) and subsequently service recovery efforts. Consequently, its moderating effects on service recovery effort are included in the research model.

Load Factor and Aircraft Productivity

Load factor is a measure of occupancy rate, or the extent to which the flight is occupied (i.e., passenger enplanements). This measure is available on Form 41 reported by Bureau of Transportation Service. Aircraft productivity is measured based on block hours per aircraft day, where block hours are the hours between pulling back from the airport gate and arriving at the down-line airport gate. Information on block hours and number of fleets are available on Form 41 reported by Bureau of Transportation service. These are the hours that an aircraft is considered to be in a revenue-producing mode.

Method of Analysis

Pooled panel data estimation has the advantages mentioned by Hsiao (2003) that it gives researchers a large number of data points, more variability, increasing the degrees of freedom and reducing the collinearity among explanatory variables and hence improving the efficiency of econometric estimates. Baltagi (2001) also prefers panel data over conventional cross-sectional or time series data as individuals, firms, states, or countries are usually heterogeneous. Time series and cross-sectional studies not controlling for this heterogeneity run the risk of obtaining biased results. Pooled panel data estimation treats the pool specification as a system of equation and estimates the model (i.e., known as "stack model" in pooled panel data estimation) using the ordinary least squares technique. This specification is appropriate when the residuals are contemporaneously uncorrelated, and time period and cross-section homoskedastic. To deal with autocorrelation, which is typical in time series analysis, we use Prais–Winsten estimators with

panel-corrected standard error and a 2SLS analysis as specified in the research model (Beck & Katz, 1995).

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 provides descriptive statistics for the variables. Note that aircraft productivity, mishandled baggage, and complaints are within ± 1 standard deviation. On-time arrivals, load factor, ROS, and ROA have standard deviations in the range of 5.87–8.80, while percent change in baggage and percent change in complaints have standard deviations of 27.63 and 73.87, respectively. Finally, the mean values for ROS and ROA are negative. Table 2 shows the means and standard deviations of key variables by airline from the period of 1990–2007. Table 2 shows Southwest has the best performance in terms of mishandled baggage, complaints, and on-time arrivals. It also has the highest ROA and ROS. Note also, except for Southwest and Alaska, the remaining eight airlines have, on average, negative returns, suggesting a rather weak financial performance for most major airlines. Thus, to better understand the impact of September 11, 2001, on the airline industry, a similar analysis was conducted for the period

Table 1. Descriptive Statistics.

	N	Minimum	Maximum	Mean	Standard Deviation
Average of $ROS_{(q+2)+(q+1)}$	586	−36.84	25.86	−1.70	8.66
ROS_{q+1}	592	−39.19	30.37	−1.58	8.89
ROS_q	592	−39.19	30.37	−1.68	8.63
Average of $ROA_{(q+2)+(q+1)}$	580	−34.94	18.72	−1.47	7.93
ROA_{q+1}	589	−38.09	22.28	−1.44	8.17
ROA_q	589	−38.09	22.28	−1.55	8.04
Air productivity	592	6.98	13.98	10.04	0.95
Baggage (per 1,000 passenger)	592	2.17	13.37	5.06	1.38
Complaints (per 100,000 passenger)	592	0.11	9.06	1.33	1.31
On-time arrival (%)	592	51.60	94.60	78.24	5.84
%Δ in complaints	592	−76.28	823.52	18.70	73.87
%Δ in baggage	592	−100.00	249.09	2.81	27.63
Load factor (%)	592	43.32	87.33	67.80	8.28

Δ Complaints$_q$ = Complaints$_q$ − Complaints$_{(q-4)}$/Complaints$_{(q-4)}$, expressed as a percent.
Δ in Baggage$_q$, calculated the same way as ΔComplaints$_q$.

Table 2. Means (Standard Deviations) of Key Indicators by Airlines Period Covered: 1990–2007[a].

	Alaska (n = 72)	America West (n = 62)	American (n = 72)	Continental (n = 68)	Delta (n = 70)	Northwest (n = 61)	Southwest (n = 72)	TWA (n = 40)	United (n = 69)	US Airways (n = 72)
ROS_q	0.67	−0.95	−4.28	−1.06	−5.57	−2.88	6.74	−9.21	−2.43	−2.08
	(3.29)	(5.77)	(10.60)	(6.31)	(12.52)	(9.36)	(2.32)	(5.92)	(11.20)	(5.42)
ROA_q	0.84	−0.32	−4.32	−0.867	−3.99	−2.60	5.15	−12.48	−1.22	−1.96
	(3.21)	(3.82)	(10.78)	(6.86)	(9.97)	(8.48)	(2.28)	(8.66)	(8.10)	(6.31)
Aircraft Productivity	10.37	9.75	11.01	9.90	10.19	9.11	10.99	9.49	10.01	9.34
	(1.16)	(0.35)	(0.86)	(0.78)	(1.01)	(0.42)	(0.24)	(0.60)	(0.65)	(0.51)
Baggage	5.17	5.14	4.69	4.61	5.14	5.20	4.18	6.05	5.62	5.46
	(1.72)	(0.88)	(1.44)	(1.19)	(1.46)	(1.22)	(0.74)	(1.15)	(1.43)	(1.99)
Complaints	0.83	1.50	2.04	1.46	1.10	1.37	0.37	2.55	1.62	1.45
	(0.94)	(.002)	(1.78)	(0.80)	(0.75)	(0.87)	(0.34)	(1.64)	(1.27)	(1.06)
On-time (%)	75.84	77.85	77.96	78.42	77.32	79.39	82.51	78.1	76.49	79.22
	(6.82)	(4.98)	(7.53)	(3.80)	(4.25)	(6.09)	(5.09)	(5.49)	(6.14)	(5.37)
Load factor (%)	64.28	69.05	68.35	68.70	67.46	69.81	66.22	61.90	70.33	66.29
	(9.51)	(7.81)	(8.09)	(9.39)	(8.99)	(9.87)	(4.85)	(6.30)	(8.44)	(8.89)
%Δ in baggage	2.01	2.45	−0.73	0.71	0.77	0.62	3.71	0.07	1.98	8.80
	(25.62)	(18.79)	(25.96)	(21.75)	(26.59)	(23.20)	(17.97)	(20.59)	(23.82)	(51.99)
%Δ in complaints	23.45	16.17	17.46	10.91	17.92	10.40	16.05	6.02	14.55	26.92
	(81.62)	(64.8)	(79.40)	(58.18)	(55.17)	(53.47)	(108.68)	(63.64)	(53.19)	(85.83)

TWA, Trans World Airlines.

[a]n denotes the quarterly data available from Compustat database after adjusting for the following factors: (1) American West merged with US Airways in the middle of 2005, while TWA ceased operations in 2001; (2) Northwest's financial information begins in the last quarter of 1992; (3) two observations greater than 10 studentized residuals were deleted. An additional six observations between six and nine studentized residuals were also deleted. This resulted in deletion of 10 observations in this study.

between 1990 and the second quarter of 2001, these results are tabulated in Appendix C – as noted, 6 out of the 10 airlines have positive mean returns for the above period. Another notable difference was that on average most airlines improved their load factor (i.e., passenger enplanements) in the past few years. This finding is consistent with Belobaba (2005).

Table 3 reports Pearson correlations. As expected, future ROA (ROS) is highly related with current ROA (ROS). Also, aircraft productivity is positively related to current and future ROS and ROA, while "complaints" is negatively associated with ROA and ROS. It is interesting to note that these associations increase over time. That is, from current quarter to one-quarter-ahead and to the longer-term future performance. However, "on-time arrivals" is negatively associated with performance; these associations range from -0.12 to -0.17. As expected, "complaints" is positively associated with "mishandled baggage" and "load factor" but negatively related to "on-time arrivals." Finally, "load factor" is positively related to "complaints" but negatively related to "percent change in mishandle baggage," "percent change in complaints," "mishandled baggage," and "on-time arrivals."

To better understand the antecedents of "complaints" a panel regression with fixed effect was performed and the results reported in Table 4. These results are consistent with conventional wisdom, that is, when flights have a higher occupancy rate, propensity to complain is higher ($p = 0.028$). In addition, mishandled baggage is positively related to complaints ($p = 0.000$). Finally, "on-time arrivals" and aircraft productivity are negatively related with complaints at $p = 0.000$ and $p = 0.058$, respectively. Next, results of 2SLS are presented.

Results explaining the next quarter's performance are reported in Tables 5 and 6. Since the airline industry is greatly influenced by general economic factors, it is not surprising to see that most of the "year" are statistically significant for both models. Note that current-quarter performance is positively related to the next-quarter performance for both ROA and ROS ($p = 0.000$). "Percent change in mishandled baggage" is negatively related to one-quarter-ahead ROA ($p = 0.07$). Note that the interaction terms (load factor × percent changed in mishandled baggage) is marginally significant at $p = 0.087$ in Table 5. This suggests, in general, "percent change in mishandled baggage" is negatively related to ROA. However, its relationship diminishes when the "load factor" is high (i.e., the coefficient of the interaction term is positive).

Results in Table 6 indicate that "complaints" is negatively related to one-quarter-ahead ROS ($p = 0.065$), while "percent change in complaints" is negatively related to one-quarter-ahead ROS ($p = 0.034$). Note that the

Table 3. Pearson Correlations.

	Average[a] ROS	$ROS_{(q+1)}$	ROS_q	Average[a] ROA	$ROA_{(q+1)}$	ROA_q	Aircraft Productivity	Baggage	Complaints	On-Time	%Δ in Baggage	%Δ Complaint
$ROS_{(q+1)}$	0.980**											
ROS_q	0.877**	0.916**										
Average[a] ROA	0.965**	0.887**	0.774**									
$ROA_{(q+1)}$	0.941**	0.963**	0.887**	0.978**								
ROA_q	0.837**	0.872**	0.963**	0.883**	0.908**							
Aircraft productivity	0.233**	0.247**	0.243**	0.245**	0.262**	0.263**						
Baggage	−0.068	−0.035	−0.044	−0.086*	−0.063	−0.071	−0.076					
Complaints	−0.152**	−0.127**	−0.066	−0.160**	−0.150**	−0.091*	−0.041	0.236**				
On-time	−0.085	−0.118**	−0.151**	−0.113**	−0.149**	−0.171**	−0.142**	−0.319**	−0.391**			
%Δ in baggage	−0.043	−0.059	−0.056	−0.047	−0.64	−0.057	−0.143**	−0.498**	−0.076	0.205**		
%Δ in complaint	−0.145**	−0.159**	−0.179**	−0.154**	−0.154**	−0.181**	−0.172**	−0.207**	−0.384**	0.248**	0.303**	
Load factor	−0.056	−0.033	−0.040	0.006	0.032	0.027	0.319***	−0.246**	0.147**	−0.207**	−0.153**	−0.092*

*Significant at 5%, **significant at 1%.
[a] Average $ROS_{(q+1)+(q+2)}$ or Average $ROA_{(q+1)+(q+2)}$.

Table 4. Panel Regression of Service Quality, Air Productivity, and Load Factor on Complaints.

Variable	Predicted Sign	Coefficient	Standard Error	*t*-Statistics	*p*-Value
Load factor	+	0.0117	0.0060	1.91	0.028*
Air productivity	+ or −[a]	−0.0990	0.0520	−1.89	0.059*
Mishandled baggage	+	0.1062	0.0270	3.80	0.000***
On-time arrival	−	−0.0428	0.0070	−5.99	0.000***
Y91		−0.0744	0.1717	−0.43	0.665
Y92		−0.3173	0.1700	−1.87	0.062[†]
Y93		−0.5510	0.1679	−3.28	0.001***
Y94		−0.5712	0.1612	−3.54	0.000***
Y95		−0.8743	0.1582	−5.53	0.000***
Y96		−1.064	0.1581	−6.73	0.000***
Y97		−0.7189	0.1576	−4.56	0.000***
Y98		−0.5406	0.1567	−3.45	0.001***
Y99		0.8476	0.1575	5.38	0.000***
Y00		1.301	0.1618	8.04	0.000***
Y01		0.3633	0.1679	2.16	0.031*
Y02		−0.0258	0.1801	−0.14	0.886
Y03		−0.4780	0.1824	−2.62	0.009***
Y04		−0.4009	0.1747	−2.29	0.022*
Y05		−0.4112	0.1736	−2.37	0.018**
Y06		−0.3155	0.1831	−1.72	0.085[†]
Constant		4.600	0.8640	5.32	0.000***

Fixed effects (within) regression   Number of observations = 681, number of groups = 10
R^2 overall = 0.4179

*Significant at 5%, **significant at 1%, ***significant at <1%, and [†]significant at 10%.
[a]With proper coordination, improved air productivity should not associate with a higher rate of complaints. Nevertheless, some airlines (e.g., Continental Lite in the early 1990s) experienced more complaints when they increased or improved their airtime (i.e., aircraft productivity). Thus, the expected sign can be either positive or negative.

interaction terms (load factor × percent changed complaints) are statistically significant at $p = 0.068$. Again, in general, "percent change in complaints" is negatively related to ROS. However, its relationship diminishes when the "load factor" is high (i.e., the coefficient of the interaction term is positive).

The marketing literature has shown that the effects of customer satisfaction (e.g., increased market share, profitability, and positive word of mouth) are believed to persist over time (Anderson et al., 1994). Consequently, we also test the effect of the longer-term future performance

Table 5. 2SLS Panel Regression[a] of the Effects of Service Quality and Service Recovery on ROA_{q+1}.

Variable	Predicted Sign	Coefficient	Standard Error	z-Statistics	p-Value
Complaints	−	−1.014	0.8757511	−1.16	0.247
%Δ Complaints	−	−0.027	0.0277128	−0.99	0.321
%Δ Mishandled baggage	−	−0.078	0.0531548	−1.47	0.070[†]
Load factor × %Δ mishandled baggage	?	0.001	0.0007593	1.71	0.087[†]
Productivity × complaints	?	−0.101	0.1371357	−0.74	0.459
Load factor × %Δ complaints?		0.0004	0.0004479	0.99	0.320
ROA_q	+	0.841	0.0241765	34.82	0.000***
Y91		−2.142	0.9802064	−2.19	0.029*
Y92		−4.108	0.9521691	−4.32	0.000***
Y93		−1.455	0.9820275	−1.48	0.138
Y94		−2.806	1.002727	−2.80	0.005***
Y95		−1.070	1.01289	−1.06	0.291
Y96		−1.774	1.046958	−1.70	0.090[†]
Y97		−1.062	1.020281	−1.04	0.298
Y98		−1.511	0.9582394	−1.58	0.115
Y99		−0.538	1.104584	−0.49	0.626
Y00		−0.695	1.776403	−0.39	0.695
Y01		−3.215	1.438926	−2.23	0.025*
Y02		−2.505	1.05613	−2.37	0.018**
Y03		−1.482	0.9874565	−1.50	0.133
Y04		−4.824	1.001063	−4.82	0.000***
Y05		−4.731	0.9795133	−4.83	0.000***
Y06		−1.830	0.9988663	−1.83	0.067[†]
Constant[c]		3.158	1.271945	2.48	0.013**

Fixed effects (within) regression	Number of observations = 598, [b]number of groups = 10
R^2 overall = 0.84	Wald χ^2 = 2447***

*Significant at 5%, **significant at 1%, ***significant at <1%, and [†]significant at 10%.
[a]Prais–Winsten regression with panel-corrected standard errors.
[b]Two observations greater than 10 studentized residual were deleted. An additional six observations between six and nine studentized residual were also deleted. This resulted in deletion of 10 observations in this study.
[c]The sample covered the period 1990–2007. Therefore, percent change in mishandled baggage and complaints (for calculation, see footnote in Table 1) for the year 1990 were "lost." Hence the analysis began with 1991. Year 2007 was coded as the constant.

(i.e., the average of one-quarter and two-quarter-ahead). Results for the longer-term future performance are reported in Tables 7 and 8. It appears that these results are more pronounced than the results of performance one-quarter ahead. "Complaints" is negatively related to longer-term future performance of ROA ($p = 0.024$) and ROS ($p = 0.017$), while "percent

Table 6. 2SLS Panel Regression of the Effects of Service Quality and Service Recovery on ROS_{q+1}.

Variable	Predicted Sign	Coefficient	Standard Error	z-Statistics	p-Value
Complaints	−	−1.397	0.9217747	−1.52	0.065[†]
%Δ Complaints	−	−0.052	0.0288827	−1.82	0.034*
%Δ Mishandled baggage	−	−0.049	0.056275	−0.88	0.380
Load factor × %Δ mishandled baggage	?	0.0008	0.0008037	1.05	0.295
Productivity × complaints	?	−0.074	0.145234	−0.51	0.610
Load factor × %Δ complaints	?	0.0008	0.0004673	1.83	0.068[†]
ROS_q	+	0.884	0.0226943	38.96	0.000***
Y91		−2.42	1.035495	−2.34	0.019*
Y92		−4.076	1.006273	−4.05	0.000***
Y93		−2.614	1.030666	−2.54	0.011**
Y94		−3.339	1.062204	−3.14	0.002***
Y95		−1.890	1.071665	−1.76	0.078[†]
Y96		−2.662	1.100832	−2.42	0.016**
Y97		−2.033	1.071489	−1.90	0.058*
Y98		−2.365	1.005553	−2.35	0.019**
Y99		−0.876	1.168208	−0.75	0.453
Y00		−0.623	1.863333	−0.33	0.738
Y01		−3.760	1.514324	−2.48	0.013**
Y02		−3.108	1.115373	−2.79	0.005***
Y03		−1.702	1.047096	−1.63	0.104[†]
Y04		−5.613	1.063828	−5.28	0.000***
Y05		−4.939	1.037794	−4.76	0.000***
Y06		−1.862	1.053138	−1.77	0.077[†]
Constant		4.155	1.342121	3.10	0.002***

Fixed effects (within) regression	Number of observations = 601, number of groups = 10
R^2 overall = 0.85	Wald χ^2 = 2776***

*Significant at 5%, **significant at 1%, ***significant at <1%, and [†]significant at 10%.

change in complaint" is negatively related to longer-term future performance of ROA ($p = 0.007$) and ROS ($p = 0.001$) while the interaction terms (load factor × percent changed complaints) are statistically significant at $p = 0.01$ and $p = 0.002$, respectively.

Discussion

Findings suggest that "complaints" is a leading indicator of future financial performance as measured by ROS one-quarter ahead. Results also indicate that this effect persists into longer-term future performance (i.e., the average of one-quarter and two-quarter-ahead) for both ROA and ROS. This means

Table 7. 2SLS Panel Regression of the Effects of Service Quality
and Service Recovery on the Average of $ROA_{(q+1)+(q+2)}$.

Variable	Predicted Sign	Coefficient	Standard Error	z-Statistics	p-Value
Complaints	−	−1.935	0.9744919	−1.99	0.024*
%Δ Complaints	−	−0.071	0.0291082	−2.45	0.007***
%Δ Mishandled baggage	−	−0.009	0.0572016	−0.16	0.873
Load factor × %Δ mishandled baggage	?	0.0002	0.0008206	0.29	0.769
Productivity × complaint	?	−0.232	0.1469601	−1.58	0.114
Load factor × %Δ complaints	?	0.001	0.000471	2.56	0.011**
ROA_q	+	0.794	0.0256219	31.02	0.000***
Y91		−2.880	1.099054	−2.62	0.009***
Y92		−5.038	1.086524	−4.64	0.000***
Y93		−2.138	1.128778	−1.89	0.058*
Y94		−4.048	1.142906	−3.54	0.000***
Y95		−1.382	1.161162	−1.19	0.234
Y96		−2.692	1.200097	−2.24	0.025*
Y97		−1.544	1.171193	−1.32	0.187
Y98		−2.280	1.101616	−2.07	0.038*
Y99		−0.905	1.279597	−0.71	0.479
Y00		−0.231	1.95829	−0.12	0.906
Y01		−3.87	1.589746	−2.43	0.015**
Y02		−3.84	1.180997	−3.25	0.001***
Y03		−2.019	1.107557	−1.82	0.068†
Y04		−6.547	1.149992	−5.69	0.000***
Y05		−5.876	1.0982	−5.35	0.000***
Y06		−2.148	1.132664	−1.90	0.058*
Constant		4.843	1.469227	3.30	0.001***

Fixed effects (within) regression	Number of observations = 580, number of groups = 10
R^2 overall = 0.82	Wald χ^2 = 2117***

*Significant at 5%, **significant at 1%, ***significant at <1%, and †significant at 10%.

that the first hypothesis is partially supported. Results also indicate that
service recovery effort in reducing mishandled baggage is associated with
higher future financial performance as measured by one-quarter-ahead
ROS. Nevertheless, this relationship diminishes when flights have a higher
"load factor" (or higher enplanements). Likewise, results also indicate that
service recovery effort in reducing complaints is associated with higher
future financial performance as measured by one-quarter-ahead ROS as well
as longer-term future performance (i.e., the average of one-quarter and two-
quarter-ahead) for both ROA and ROS. Nevertheless, this relationship
diminishes when flights have a higher "load factor" (or higher enplane-
ments). Consequently, the second hypothesis is partially supported. Finally,

Table 8. 2SLS Panel Regression of the Effects of Service Quality and Service Recovery on the Average of $ROS_{(q+1)+(q+2)}$.

Variable	Predicted Sign	Coefficient	Standard Error	z-Statistics	p-Value
Complaints	−	−2.360	1.109455	−2.13	0.017**
%Δ Complaints	−	−0.098	0.0332458	−2.97	0.001***
%Δ Mishandled baggage	−	0.017	0.065639	0.26	0.792
Load factor × %Δ mishandled baggage	?	−0.0001	0.0009427	−0.21	0.834
Productivity × complaints	?	−0.205	0.1696899	−1.21	0.227
Load factor × %Δ complaints	?	0.001	0.0005384	3.05	0.002***
ROS_q	+	0.804	0.0262257	30.67	0.000***
Y91		−3.764	1.273006	−2.96	0.003***
Y92		−5.925	1.253104	−4.73	0.000***
Y93		−4.036	1.293311	−3.12	0.002***
Y94		−5.215	1.320498	−3.95	0.000***
Y95		−2.912	1.338705	−2.18	0.030*
Y96		−4.085	1.377171	−2.97	0.003***
Y97		−3.037	1.344673	−2.26	0.024*
Y98		−3.521	1.265986	−2.78	0.005***
Y99		−1.590	1.466776	−1.08	0.278
Y00		−0.487	2.236995	−0.22	0.828
Y01		−5.368	1.827914	−2.94	0.003***
Y02		−4.643	1.356442	−3.42	0.001***
Y03		−2.970	1.283796	−2.31	0.021*
Y04		−8.012	1.328508	−6.03	0.000***
Y05		−6.872	1.273016	−5.40	0.000***
Y06		−2.870	1.310425	−2.19	0.028*
Constant		6.466	1.683254	3.84	0.000***

Fixed effects (within) regression	Number of observations = 586, number of groups = 10
R^2 overall = 0.80	Wald χ^2 = 1,928***

*Significant at 5%, **significant at 1%, and ***significant at <1%.

we found no evidence of an interaction effect between "aircraft productivity" and "service quality" as measured by complaints. As a result, the third hypothesis is not supported.

SUMMARY AND CONCLUSIONS

According to a University of Michigan survey of 33 US institutions, the airline industry was next to the last in consumer satisfaction ratings, only ahead of the Internal Revenue Services (The Federal Aviation Administration, 1999). The marketing literature has shown that complaints are extreme

manifestation of dissatisfaction. There is also evidence that 70–95% of dissatisfied customers do not complain to service providers but rather engage in less visible behavior such as "exit" or negative word-of-mouth (Harari, 1992; Singh, 1990). Accordingly, Best and Andreasen (1977) refer to complaints as the "tip of the iceberg." It is evidenced that only a fraction of customers who experienced service failure will eventually file a complaint to the DOT. Thus, customers who file complaints to the DOT may be extremely unhappy. If indeed "complaints" is an extreme manifestation of dissatisfaction, it is not surprising why "complaints" is a leading indicator of future financial performance for one-quarter ahead and the longer-term future performance (i.e., the average of one-quarter and two-quarter-ahead) as measured by ROA or ROS.

Lapre (2006) asserts that hiring, training, and empowerment are critical in preparing employees for their service recovery role. This means that management can and should train employees (front line and flight attendants included) to provide comfort, assurance, empathy, support, and assistance to customers following service failures such as flight delays, cancellations, misconnections, over boarding, or mishandled baggage. Likewise, compensatory services such as food vouchers, free hotel accommodations, flight vouchers, etc., may sooth angry customers thereby enhancing repurchase behavior and brand loyalty. Gittell (2003) examined hiring and training practices at four major airlines – Southwest, Continental, United, and American. She reported significant variation in airlines' hiring and training practices that may affect their employees' ability to relate effectively with others and in instances of service failure. She reported that Southwest scored the highest in hiring for relational competence, while American scored the lowest. Incidentally, during the period of our study (i.e., 1990–2007) our findings show that Southwest ranked #1 in on-time arrivals, mishandled baggage, and complaints among the major airlines.

When an air traveler decides to file a complaint to the DOT, the individual is required to indicate the reason for complaint, which can be broken down into 12 categories (see Appendix A, *Air Travel Consumer Report*, February 2008). Appendix B, on the other hand, provides additional information on complaint categories from the year 2003 to 2007. As shown, flight-related problems (e.g., delays, cancellations, or misconnections) consistently ranked #1 (ranging 21–34% of all complaints filed to the DOT), baggage-related problems consistently ranked #2 (ranging 18–23% of all complaints filed to the DOT), while ticketing/boarding/reservation consistently ranked #3 (ranging 11–15% of all complaints filed to the DOT). Accordingly, to improve future profitability, major airlines may want to pay close attention to

problems associated with delays, mishandled baggage, and critical services such as boarding and reservation. Most important of all, perhaps, the employees of major airlines should take every opportunity to relieve pressures, discomfort, or frustrations on the part of customers such that the negative effects of service failure can be mitigated which may increase the chances of ''repeat purchase'' decisions whereby improving future financial performance.

This study makes several contributions. First, findings for ''complaints'' suggest that disgruntled customers are likely to negatively affect future profitability. This suggests that continued research on leading indicators is likely to provide important information for airline management. Second. The service operation literature states that in times of service failure, employees are critical to mitigating the effects of operations failure (Goldstein, 2003). That is, although service failure negatively affects customer repurchase intentions, employees' ability to diagnose and respond to problems can overcome negative effects of a service failure (Bitner et al., 1990; Tsiros, Mittal, & Ross, 2004). Alternatively, service failure followed by poor service recovery leads to customer dissatisfaction and dissatisfied customers are likely to engage in negative word-of- mouth behavior, which may affect a firm's future profitability. Our findings on service recovery (i.e., reducing mishandled baggage and reducing complaints) provide support in this regard. Last, but not least, advocates for the use of nonfinancial measures suggest that these nonfinancial measures enhanced or are better indicators of future financial performance and hence they are useful in evaluating and motivating managerial performance. Results in this study provide support for this assertion. Findings indicate that nonfinancial measures such as complaints, change/reduction in mishandled baggage, or change/reduction in complaints are significantly associated with future financial performance as measured in terms of ROA or ROS. This implies that managers may want to closely monitor service quality such as on-time arrivals and mishandled baggage such that ''complaints'' can be minimized. Thus, this study adds to the extent literature that nonfinancial performance variables exhibit incremental relevance over and above traditional accounting metrics and these operating measures may need to be closely monitored if managers wish to improve their future financial performance (Ittner & Larcker, 1998; Kaplan & Norton, 1996, 2004; Maines et al., 2002).

There are several limitations in this study. First, although the hypothesis on service recovery is supported, the archival data does not enable us to adopt a more robust measure of service recovery concepts. Future studies may want to consider adopting a survey methodology to further examine this concept.

Second, this study focuses on domestic airlines, hence it is unclear whether the findings can be generalized to international airlines, which is an important segment of the airlines industry. Third, except for passenger complaints, other customer service variables such as on-time arrivals and mishandled baggage were self-reported by individual airlines and thus the reliability of these measures is questionable.

NOTES

1. *Twenty Years of Deregulation: 1978 to 1998*, The Federal Aviation Administration (FAA), Office of Aviation Policy and Plans (APO), 1999 (http://api.hq.faa.gov/pubs.asp?lev2-4).

2. See http://web.mit.edu/airlines/www/index2.htm

3. Decisions such as purchasing of aircraft, leasing or building new airport facilities, or routing change often require long-term planning. It is plausible that short-term accounting information is noisy in explaining future growth.

4. "United offers miles to late-arriving passengers," Associated Press, June 14, 2005 (http://www.airportbusiness.com).

5. When asked about the possibility that the improvements were due to other changes, the research team was reminded that the bonus program was the primary activity aimed at improving employees' performance (Knez & Simester, 2001, p. 749). Also, improvement in the economy during the middle part of 1990s may have contributed to the improved profitability of Continental.

6. Numerous categories of complaints were listed in Appendix A. Except for on-time arrivals and mishandled baggage, other information were not readily available.

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APPENDIX A. COMPLAINT CATEGORIES

Complaint Category	January–December 2007			January–December 2006		
	Ranking	Complaints	Subcategory	Ranking	Complaints	Subcategory
Flight problems	1	4,465		1	2,162	
Cancellations			2,045			832
Delays			1,229			475
Misconnections			622			453
Baggage	2	2,894		2	1,936	
Reservation/ticketing/boarding	3	1,495		4	1,007	
Customer service	4	1,365		3	1,019	
Refunds	5	1,024		5	774	
Oversales	6	482		7	341	
Disability	7	480		6	430	
Other	8	416		9	247	
Frequent flyer			281			190
Fares	9	392		8	252	
Discrimination	10	99		10	114	
Advertising	11	46		11	40	
Animals	12	10		12	3	
Complaint total		13,168			8,325	

Source: Air Travel Consumer Report, February 2008.

APPENDIX B. COMPLAINT CATEGORY – RANKING (1, 2, AND 3) FROM 2003 TO 2007

Complaint Category	2007	2006	2005	2004	2003
Flight problems	(1) 33.91%	(1) 25.97%	(1) 25.58%	(1) 23.20%	(1) 21.05%
Baggage	(2) 21.98%	(2) 23.26%	(2) 23.30%	(2) 19.12%	(2) 18.03%
Reservation/ticketing/boarding	(3) 11.35%	(4) 12.10%	(3) 11.33%	(3) 12.47%	(3) 14.72%
Customer service		(3) 12.24%			

Source: Air Travel Consumer Report, February 2004–2008.

APPENDIX C. MEANS (STANDARD DEVIATIONS) OF KEY INDICATORS BY AIRLINES – PERIOD COVERED: 1990–2001, QUARTER 2

	Alaska	America West	American	Continental	Delta	Northwest	Southwest	TWA	United	US Airways
ROS_q	1.18	−2.39	1.89	−1.14	1.23	0.59	7.01	−9.20	1.85	−1.92
	(3.74)	(7.37)	(2.69)	(7.68)	(4.66)	(5.38)	(2.66)	(5.92)	(3.09)	(5.79)
ROA_q	1.40	−2.44	1.59	−1.07	0.99	0.68	5.95	−12.48	1.85	−1.56
	(3.74)	(8.48)	(2.23)	(8.50)	(4.60)	(5.73)	(2.39)	(8.66)	(3.13)	(6.38)
Aircraft Productivity	10.24	11.29	9.72	9.64	9.98	9.19	10.98	9.49	9.84	9.20
	(1.28)	(0.75)	(0.29)	(0.62)	(.32)	(0.41)	(0.26)	(0.60)	(0.42)	(0.41)
Baggage[a]	5.84	5.03	5.10	5.01	5.10	5.74	4.20	6.00	6.26	5.22
	(1.44)	(1.52)	(0.76)	(1.16)	(1.01)	(1.09)	(0.61)	(1.09)	(1.21)	(1.22)
Complaints[b]	0.80	2.26	1.57	1.58	0.90	1.40	0.33	2.57	1.63	1.21
	(0.58)	(1.99)	(1.11)	(0.91)	(0.67)	(1.03)	(0.15)	(1.65)	(1.50)	(0.998)
On-time (%)	76.64	77.30	78.20	78.37	77.04	80.50	83.06	78.19	75.78	78.72
	(7.43)	(8.10)	(4.80)	(3.45)	(4.37)	(6.34)	(5.87)	(5.54)	(6.40)	(5.02)
Load factor (%)	59.24	64.25	63.95	63.15	62.48	63.59	64.21	61.64	65.47	61.23
	(8.12)	(4.77)	(6.18)	(6.91)	(7.13)	(6.29)	(3.78)	(6.28)	(6.03)	(6.64)

TWA, Trans World Airlines.
[a]Mishandled baggage per 1,000 passengers.
[b]Complaints per 100,000 passengers.

NONFINANCIAL PERFORMANCE MEASURES AND EARNINGS MANAGEMENT ☆

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ABSTRACT

We examine the earnings management implications of using nonfinancial performance measures (NFPM) in executive compensation contracts. We argue and test that when a manager's compensation is based on financial and NFPM, he/she has less incentive to manipulate earnings to maximize compensation. Using panel data covering the period 1992–2005, we compare earnings management behavior for a sample of firms that used both financial and nonfinancial measures to a matched sample of firms that based their performance measurement solely on financial measures. The results are mainly consistent with a reduction in earnings management behavior for those firms that rely on NFPM in their compensation contracts.

1. INTRODUCTION

Agency theory views corporations as connected series of efficient contracts that maximize shareholders values (Jensen & Meckling, 1976). The board of directors uses accounting numbers in most aspects of these efficient contracts (e.g., determining compensation and monitoring managerial performance) in an attempt to mitigate possible conflicts of interest. A large body of the accounting research suggests that in some instances managers use their accounting discretion to achieve predetermined results to the point where financial information no longer reliably represents a company's underlying economic condition.[1] Although accounting research addresses the compensation incentive to manage earnings (Fields, Lys, & Vincent, 2001; Murphy, 1999), unresolved issues remain. One such issue, whether the strength of earnings management depends on the structure of the performance measures included in the compensation contracts, is the subject of this paper.

Although, the objective of compensation-based contracts is to align managers' interests with those of shareholders, inappropriately constructed compensation contacts may result in perverse outcomes when actions taken by managers result in wealth reduction for shareholders (Fields et al., 2001). To *partially* deal with this concern, companies have started introducing nonfinancial performance measures (NFPM) into executive compensation contracts. Prior research examines the choice to adopt and the role of NFPM in executive compensation contracts (e.g., Banker, Potter, & Srinivasan, 2000; Bushman, Indjejikian, & Smith, 1996; Core, Guay, & Verrecchia, 2003; Ittner & Larcker, 1997; Ittner & Larcker, 1998a, 1998b). One area that is left unexamined is whether the use of NFPM has unintended consequences on earnings management. Our study fills that void in the literature; that is, we explore the effects on earnings management behavior due to the shift in treating financial figures as the foundation for performance measurement to treating them as one element among a broader set of measures.

When executive compensation is based on accounting numbers, managers have incentives to manage earnings to maximize their compensation. Firms introduce NFPM into their compensation contracts to enhance the alignment of interests between management and shareholders (Banker et al., 2000), to focus attention on a long-term perspective (Strivers, Covin, Hall, & Smalt, 1998; Kaplan & Atkinson, 1989; Lambert, 2001), and to understand the relations among various strategic objectives (Kaplan & Norton, 1996; Banker & Datar, 1989). Moreover, strategic NFPM are less subject to manipulation since they are typically less dependent on managerial judgment than are cost allocations or balance sheet valuations (Banker et al., 2000).

Surysekar (2003) shows that when multiple measures that interact with each other are used in the compensation contract, the direct effect of one measure (e.g., earnings management motivated by earnings measures) may be undone by the indirect effect of another measure (e.g., less earnings management motivated by NFPM). To understand how the use of NFPM affects managerial behavior, it is important to understand the effect of NFPM on the weight placed on accounting income in the compensation contracts and the cost of earnings management. Hemmer (1996) shows that depending on the type of NFPM, the weight placed on earnings in compensation contracts might increase or decrease. Specifically, Hemmer (1996) shows that, when the average (number)^2 customer satisfaction measure is used, it should be accompanied by an increased (decreased) emphasis on earnings-based measures.

The strength of managers' incentives to manage earnings when NFPM exist depends on the trade-offs that managers make between the expected cost of earnings management and the penalty (opportunity cost) of not achieving NFPM-based compensation. If the existence of NFPM is accompanied with a decreased weight on earnings, managers would still have economic incentives to manage earnings because earnings still matter for compensation. However, if the use of NFPM increases the cost of earnings management, managers might reduce earnings management once it fails to pass the cost–benefit test.[3]

We believe that earnings management becomes more costly once NFPM are introduced into compensation contracts because of the opportunity cost. When managers engage in earnings management, they dedicate less effort to improving the NFPM, which eventually might reduce the NFPM-based compensation component. Therefore, managers manipulate earnings only when the benefits of increased earnings management exceed the loss of the compensation based on NFPM. Assuming a nonzero cost of earnings management, as earnings management becomes relatively more costly than the penalty of not meeting the NFPM-based compensation, a rational manager increase effort to achieve the NFPM targets, and decrease effort to manage earnings. Rational managers will not engage in earnings management in the absence of expected net benefits (Fields et al., 2001). Therefore, as the weights placed on financial measures are reduced to the point where the benefits of earnings management are less than its cost, managers will have less compensation incentive to manage earnings.

Nevertheless, we can argue the same if the use of NFPM increases the weight placed on earnings in compensation contracts. Obviously, the greater weight placed on earnings will increase the managers' incentives to manipulate

earnings. However, the incremental cost to earnings management resulting from the use of NFPM might reduce earnings management. Therefore, it is crucial to test empirically the effects of NFPM on earnings management behavior, given the assumption that earnings management is costly.

Using a sample of firms that used NFPM in their compensation contracts (and a matching sample of firms that used only financial performance measures) during the period 1992–2005, we examine earnings management behavior as reflected in absolute discretionary accruals and absolute performance-matched discretionary accruals. We document lower magnitude of earnings management behavior for these firms relative to firms that rely solely on financial performance measures in their executive compensation contracts. These results complement prior research on the implications of using NFPM by reducing agency problem and providing better alignment of interests between management and shareholders. Consistent with Surysekar (2003), our results support the claim that when multiple measures are used, their interactions need to be carefully studied for potential surprises.

This is the first study that we are aware of that examines the role of using NFPM on earnings management. The positive effects of using NFPM as manifested in decreasing managers' motivation to manipulate earnings have implications on the effectiveness of using performance measurement system that incorporates both nonfinancial and financial measures of performance. The results imply that properly constructed performance measures in compensation contacts may increase the alignment of managers' interests with those of shareholders, which in turn may maximize the shareholders value as conjectured by the efficient contracting theory.

The paper proceeds as follows: the next section reviews related literature and develops the hypotheses investigated in this study. The third section presents sample selection and research design. Section 4 presents the results, and Section 5 concludes.

2. PRIOR LITERATURE AND HYPOTHESES DEVELOPMENT

2.1. Earnings Management and Compensation Contracts

The major motivation for our investigation lies within the boundaries of agency theory. Research in economics models the firm as a set of contracts among individuals, assuming that individuals act to maximize their own

utility (Fama, 1980; Fama & Jensen, 1983; Jensen & Meckling, 1976). Gordon (1964), in an early attempt to derive a positive theory of accounting, assumes that management selects accounting procedures to maximize its own utility, thus suggesting that management acts in its own self-interest.

The potential conflict of interest between managers and nonmanager equity owners has been extensively investigated in the finance literature. Analyzing this conflict, Jensen and Meckling (1976) indicate that as managers' percentage ownership of the residual claims of a firm decreases, increases in the value of those residual claims have less effect on managers' wealth. An objective of financial reporting is to provide information that helps shareholders assess managerial performance. However, managers use their knowledge about the business and its opportunities to select reporting methods, estimates, and disclosures that might not accurately reflect their firms' underlying economics (Healy & Wahlen, 1999). Moreover, asymmetric information between managers and outside parties about the firm, its prospects, incentives, and opportunities might induce managers to manipulate earnings.

Positive accounting theory (Watts & Zimmerman, 1986) attempts to explain earnings management, largely in terms of agency costs. Within the agency cost framework, management compensation agreements are designed to motivate managers to maximize firm value by aligning their interests with those of the stockholders (Smith & Watts, 1982). Therefore, within the agency cost framework, management compensation contracts are viewed as devices to overcome the conflict between management and shareholders, thus minimizing agency costs.

Prior researchers have provided evidence on the influence of bonus contracts on earnings management behavior. For example, Healy (1985) shows that income decreasing accruals are more likely when the upper or lower bound of the bonus contract is binding, while income increasing accruals are more likely when neither is binding. Using business unit-level data within a single corporation, Guidry, Leone, and Rock (1999) support Healy's bonus plan hypothesis. Holthausen, Larcker, and Sloan (1995) and Gaver, Gaver, and Austin (1995) also confirm the existence of upwards and downwards earnings management around the upper bound, suggesting that managers have incentives to manage earnings around a target to maximize bonus payments. Balsam (1998) finds a significant positive relation between discretionary accruals and cash compensation, suggesting that firms reward managers' efforts to manage earnings upwards. Matsunaga and Park (2001) evidence indicates that CEO bonuses provide managers with incentives to meet analyst earnings forecasts and the earnings for the same quarter of the prior year. Therefore, management compensation contracts are designed to

motivate managers to maximize firm value and align the interests of managers with stockholders (Smith & Watts, 1982). However, managers choose reporting strategies that maximize their own expected compensation, taking into account the effect of earnings reports on investors' perceptions and subsequently management's compensation (Goel & Thakor, 2003).

2.2. Nonfinancial Measures in Compensation Contracts

Economics, agency, and contingency theories suggest that the choice of the appropriate managerial accounting techniques depends on circumstances surrounding the firm (Gordon & Miller, 1976; Hayes, 1977; Otley, 1980). Traditionally, firms have used financial measures to reward managerial performance, where compensation plans formally tie compensation to measures of firm value such as earnings per share, net income, and operating income (Ittner, Larcker, & Rajan, 1997; Murphy, 2001).

The agency theory and the informativeness principle (Banker & Datar, 1989; Feltham & Xie, 1994; Holmstrom, 1979) suggest that NFPM should be included in the executive compensation contracts if they provide incremental and/or relative information about manager's actions over and above that conveyed by financial measures. Ittner et al. (1997) argue that NFPM should be included in the compensation contract because they convey information about desired managerial actions. Such inclusion would motivate managers to act in the best interest of shareholders. Thus, NFPM are used in situations where various enhancing actions of managers are either missing from or not fully captured by financial performance measures. Since the NFPM are forward looking, using them in compensation contracts induces short-horizon managers to take actions that reflect the long-term interests of shareholders (Sedatole, Kulp, & Dikolli, 2003; Hemmer, 1996).

The use of NFPM, such as customer satisfaction, employee satisfaction, productivity, product quality, and market share has increased tremendously.[4] This trend in the use of NFPM in compensation contracts triggered a wave of empirical research on the use of NFPM and its performance consequences. One stream of research examines the ability of NFPM in predicting future financial performance. This literature generally documents that NFPM are leading indicators of financial performance and that they are incrementally value relevant beyond the information contained in financial accounting measures (Amir & Lev, 1996; Banker et al., 2000; Behn & Riley, 1999; Hirschey, Richardson, & Scholz,

2001; Ittner & Larcker, 1996; Nagar & Rajan, 2001; Riley, Pearson, & Trompeter, 2003).

Another stream of research examines the use of NFPM for compensation purposes. Specifically, Davila and Venkatachalam (2004) and Srinivasan, Sayrak, and Nagarajan (2003) test whether NFPM provide incremental explanatory power over financial measures in explaining cross-sectional variation in executive compensation. Finally, researchers investigate factors influencing the relative weights placed on the NFPM and the performance consequences of the use of NFPM (Said, HassabElnaby, & Wier, 2003; HassabElnaby, Said, & Wier, 2005).

2.3. Earnings Management and Nonfinancial Measures

Our study links the earnings management research with the literature on the use of NFPM in compensation contracts. Specifically, we examine the impact of using NFPM in compensation contracts on managers' earnings management behavior. The extant literature provides a persistent evidence of earnings management behavior in response to executive compensation contracts, specifically the bonus component that is based on financial performance measures. We attempt to examine whether the use of NFPM in compensation contracts is associated with such behavior.

Managers take advantage of the discretion provided by the compensation contract to increase their compensation when the executive compensation contract is based on accounting numbers. Firms use NFPM into compensation contracts to enhance the alignment of interests between management and shareholders (Banker et al., 2000), to focus attention on a long-term perspective (Strivers et al., 1998; Kaplan & Atkinson, 1989; Lambert, 2001), and to understand the relations among various strategic objectives (Kaplan & Norton, 1996; Banker & Datar, 1989). Strategic NFPM are claimed to be less subject to manipulation than cost allocations or balance sheet valuations since they are typically less dependent on managerial judgment (Banker et al., 2000).[5] The use of strategic NFPM, which are legitimate leading indicators of financial performance, may motivate managers to not excessively focus on current period earnings performance but instead be focused more on the long-term performance. This will likely lead to less earnings manipulation.

When multiple measures that interact with each other are used in the compensation contract, the direct effect of one measure may be undone by the indirect effect of the other measure (Surysekar, 2003). Accordingly,

the upward earnings manipulation motivated by earnings-based measures could be undone by the use of NFPM. To understand how the use of NFPM affects managerial accounting behavior, it is imperative to understand the effect of NFPM on the weight placed on earnings in the compensation contracts and the cost of earnings management. Hemmer (1996) shows that depending on the type of the NFPM, the weight placed on earnings in compensation contracts might change. The decision to use NFPM in the compensation contract has direct implications on the weight placed on observable measures, such as accounting income, and has very different implications (Hemmer, 1996). Specifically, Hemmer (1996) explains the following:[6]

> The analysis in this paper yields the following insights. First, I show that when customer satisfaction data can be obtained freely, the ratio and the number measures are economically equivalent. However, how they are combined with the more traditional performance measure of "accounting income" in optimal compensation contracts is quite different. Specifically, introduction of the "number" in the performance evaluation must be matched with a *decreased* weight on accounting income. This corresponds with the predictions offered by Kaplan and Atkinson (1989) that companies can be expected to rely *more* on nonfinancial and *less* on short-run financial control measures. Not so for the "average." An *increase* in the role that accounting income plays in the performance evaluation must accompany the introduction of this measure. (p. 89)

When compensation contracts include earnings and NFPM, the strength of managers' incentives to manage earnings depend on the trade-offs that managers make between the expected cost of earnings management and the penalty (opportunity cost) of not achieving the compensation portion that is based on NFPM. If the existence of NFPM is accompanied with a decreased weight on earnings, managers would still have economic incentives to manage earnings because earnings still matter for compensation. However, if the use of NFPM increases the cost of earnings management, managers might manage earnings to a less extent once earnings management is not economically justified.

We believe that earnings management becomes more costly once NFPM are introduced into compensation contracts because of the opportunity cost. Specifically, when managers engage in earnings management, they dedicate less managerial effort to improving the NFPM, which eventually might reduce the NFPM-based compensation component. Thus, managers manage earnings only when the benefits of increased earnings management will exceed the loss of the compensation based on NFPM. Assuming a nonzero cost of earnings management, as earnings management becomes relatively more costly than the penalty of not meeting the NFPM-based compensation, a rational manager increases effort to achieve the NFPM targets, and decreases effort to manage earnings. Thus, as the weights placed on earnings measures

are reduced to the point where the benefits of earnings management are less than its cost, managers will be unprovoked to manage earnings.

Nevertheless, we can argue the same if the use of NFPM increases the weight placed on earnings in compensation contracts. Obviously, the greater weight placed on earnings will increase the managers' incentives to manipulate earnings. However, the incremental cost to earnings management resulting from the use of NFPM might reduce the benefits of earnings management. Therefore, it is crucial to test empirically the effect of NFPM on earnings management behavior maintaining the assumption that earnings management is costly.

Some might argue that the lack of informativeness of earnings creates lower incentives to manage earnings, independent of the use of NFPM. However, economic theory suggests that performance metrics should include not only financial performance measures but also NFPM that reflect different dimensions of managerial actions (Banker & Datar, 1989; Ittner & Larcker, 1998b). Regardless of the informativeness of the financial measures, NFPM are included in management compensation contracts if NFPM provide incremental information about manager's actions beyond that conveyed by financial measures (Said et al., 2003). Thus, it is not the lack of the informativeness of earnings that creates lower incentives to manage earnings; rather it is the enhanced informativeness of NFPM on managerial actions that shareholders wish to encourage.

With the introduction of NFPM, managers need to exert efforts to improve these measures. Given the allocation of effort problem, the marginal cost of managerial effort to manage earnings in order to improve financial performance measure will increase, and thus the benefit over cost of earnings management will decrease. Based on the above arguments, we hypothesize that the magnitude of earnings management decreases for firms that rely on NFPM. The hypothesis stated in the alternative form is:

H1. The magnitude of earnings management is negatively related to the use of NFPM.

3. SAMPLE AND RESEARCH DESIGN

3.1. Sample Selection Procedures

We use proxy text files contained in Lexis/Nexis to develop a sample of firms that we judge to be using NFPM for 1992–2005. We identify the sample by

searching these files using some keywords.[7] We read the compensation committee report to confirm that the keyword(s) are used in the appropriate context. Consistent with Gore, Matsunaga, and Yeung (2004), we discard financial service firms (SIC codes 6000–6999) and require firms to be included in Compustat. We eliminate partial year (i.e., new and existing) executives, as compensation in those years may be affected by hiring bonuses or retirement.

We construct a control sample by matching our treatment sample firms with firms that did not use NFPM in their executive compensation contracts. We match firms on the basis of year, two-digit SIC codes, and return on assets. We examine the proxy statement of our control sample to verify that none of these firms used NFPM in their executive compensation contracts. Moreover, we require the availability of all compensation variables to calculate earnings management proxies. The final sample consists of 231 firm-year observations in each group. We use panel data (firm-year observations) in our analysis since prior research indicates that firms may drop the use of the NFPM for many reasons after the initial adoption and they may increase or decrease the weight placed on NFPM from a year to another (HassabElnaby et al., 2005).

3.2. Earnings Management Proxies

We use two abnormal accruals measures as our proxies for earnings management. The two measures we use are the absolute value of discretionary accruals (ADA) and the absolute value of performance-matched discretionary accruals (APMDA). We use the modified version of the Jones (1991) model as in Dechow, Sloan, and Sweeney (1995) to estimate discretionary accruals. Consistent with prior research (e.g., Hribar & Collins, 2002), we define total accruals as the difference between net income before extraordinary items and operating cash flow. We obtain total accruals directly from the statement of cash flows.

$$TAC_{it} = IBXI_{it} - CFO_{it} \tag{1}$$

where TAC is total accruals, IBXI the income before extraordinary items and discontinued operations (Compustat data item #123), and CFO the operating cash flows from continuing operations (Compustat data item #308– Compustat data item #124). Then, we estimate the following regression:

$$\frac{TAC_{it}}{A_{it-1}} = \alpha_1 \left(\frac{1}{A_{it-1}}\right) + \alpha_2 \left(\frac{\Delta REV_{it}}{A_{it-1}} - \frac{\Delta AR_{it}}{A_{it-1}}\right) + \alpha_3 \left(\frac{PPE_{it}}{A_{it-1}}\right) + \omega_{it} \tag{2}$$

where A is total assets (Compustat data item #6), ΔREV the change in net revenues (Compustat data item #12), ΔAR the change in accounts receivables (Compustat data item #2), and PPE the gross property, plant, and equipment (Compustat data item #7). We scale all variables in the discretionary accruals model by lagged total assets to reduce heteroscedacity (Gaver et al., 1995). We estimate the model in Eq. (2) for each two-digit SIC code for each fiscal year in our sample. To reduce the effect of outliers on the estimates, we winsorize all variables in Eq. (2) at the 1st and 99th percentiles. We obtain the ordinary least squares estimates of α_1, α_2, and α_3 from Eq. (2) and use them to estimate nondiscretionary accruals as follows:

$$\text{NDAC}_{it} = \hat{\alpha}_1 \left(\frac{1}{A_{it-1}} - 1 \right) + \hat{\alpha}_2 (\text{REV}_{it} - \text{AR}_{it}) + \hat{\alpha}_3 \text{PPE}_{it} \qquad (3)$$

where NDAC is estimate of nondiscretionary accruals. Finally, discretionary accruals (ADA) are the absolute value of the difference between total accruals and the fitted nondiscretionary accruals as:

$$\text{ADA} = |\text{TAC}_{it} - \text{NDAC}_{it}| \qquad (4)$$

We estimate performance-matched discretionary accruals (PMDA) as in Kothari, Leone, and Wasley (2005). We start with the discretionary accruals and match each treatment firm with a control firm on the basis of year, two-digit SIC code, and current return on assets. We estimate the discretionary accruals for the control sample, and calculate the APMDA as the absolute value of the difference between the discretionary accruals for each sample firm and the discretionary accruals for its matching firm.

3.3. Earnings Management Control Variables

Following recent studies on earnings management (e.g., Hribar & Nichols, 2007; Raman & Shahrur, 2008), we include firm characteristics that have been identified by prior research to be correlated with the absolute value of discretionary accruals (see also Bergstresser & Philippon, 2006). The variables we include are leverage, firm size, book-to-market ratio, return on assets, cash flows from operating activities, sales growth, firm's age, variability of cash flows, net income, and sales. Hribar and Nichols (2007) show that the magnitude of absolute discretionary accruals is likely to be correlated with measures of underlying operating volatility. Therefore, we include volatility of cash flows, net income, and sales to control for operating volatility. The regressions also include year and industry indicator variables to further control for any omitted year or industry effects. We also

control for the equity component of compensation by including the stock option grants as a percentage of total compensation.

Table 1 provides the descriptive statistics for both the treatment and control groups. We provide the statistics for the proxies of earnings management (APMDA and ADA), the weight on NFPM (WNFM), and for earnings management control variables. For the treatment group, the NFPM comprise about 36% of the total bonus, indicating that our treatment sample tend to use multiple NFPM in compensation contracts.[8] The maximum (minimum) weight on NFPM is 80 (10)%. The averages of the proxies of earnings management are significantly greater for control firms, consistent with firms that use NFPM engage less in earnings management than firms that do not use NFPM. Other statistics provide the same results, with the exception of the 10th percentile for APMDA where that statistic is the same for both groups. The statistics for control variables show no significant differences between treatment and control firms in the percentage of stock option grants, size, sales growth, and the variability of cash flows and sales. The significant differences for other variables between the two groups show that treatment firms are older than control firms, enjoy higher growth (i.e., lower book-to-market ratio), are more profitable (higher ROA), generate higher operating cash flows for each dollar of assets, and have more stable earnings (lower variability of net income). The differences between the two groups in control variables might explain the difference in unsigned accruals between them.

3.4. Empirical Models

To examine the earnings management consequences of using NFPM, we regress our measures of earnings management on the weight of NFPM in bonus contracts and the control variables for earnings management as in the following model:

$$\begin{aligned} EM_{it} = {}& \beta_0 + \beta_1 WNFM_{it} + \beta_2 OPTIONS_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} \\ & + \beta_5 BTM_{it} + \beta_6 ROA_{it} + \beta_7 CFO_{it} + \beta_8 Sales\_Growth_{it} \\ & + \beta_9 Cashflow\_std_{it} + \beta_{10} Income\_std_{it} + \beta_{11} Sales\_std_{it} \\ & + \beta_{12} AGE_{it} + \varepsilon_{it} \end{aligned} \quad (5)$$

where EM is one of the two earnings management measures: (1) the absolute value of discretionary accruals (ADA), and (2) the absolute value of performance-matched discretionary accruals (APMDA), WNFM the weight

Table 1. Descriptive Statistics.

Variable	Treatment Sample					Control Sample					t-Test
	Mean	Median	STD	10th percentile	90th percentile	Mean	Median	STD	10th percentile	90th percentile	
APMDA	0.079	0.047	0.098	0.009	0.190	0.105	0.067	0.130	0.009	0.255	2.44**
ADA	0.058	0.039	0.061	0.007	0.135	0.070	0.047	0.083	0.008	0.147	1.73*
WNFM	0.364	0.350	0.140	0.200	0.500	0.000	0.000	0.000	0.000	0.000	39.55***
OPTIONS	0.332	0.306	0.266	0.00	0.735	0.294	0.225	0.282	0	0.752	1.32
LEV	0.257	0.272	0.156	0.014	0.410	0.311	0.322	0.148	0.098	0.482	3.81***
SIZE	8.343	8.317	1.370	6.614	10.205	8.334	8.281	1.371	6.557	10.210	0.070
ROA	0.058	0.052	0.071	0.012	0.116	0.021	0.036	0.099	-0.051	0.102	4.63***
CFO	0.112	0.104	0.060	0.046	0.195	0.093	0.083	0.077	0.020	0.187	2.97***
BTM	0.625	0.668	0.239	0.281	0.904	0.718	0.741	0.256	0.390	0.985	4.02***
Sales_Growth	1.112	1.073	0.241	0.931	1.362	1.163	1.075	0.603	0.847	1.430	1.190
Cashflow_std	0.095	0.081	0.063	0.026	0.179	0.104	0.071	0.237	0.022	0.181	0.520
Income_std	0.061	0.047	0.051	0.015	0.124	0.083	0.041	0.197	0.014	0.150	1.65*
Sales_std	0.706	0.606	0.553	0.228	1.197	1.021	0.566	5.150	0.196	1.368	0.920
AGE	43.567	47.000	11.729	20.000	53.000	37.316	44.000	14.048	15.000	53.000	5.19***

Variable definitions: ADA is the absolute value of discretionary accruals; APMDA the absolute value of performance-matched discretionary accruals; WNFM the weight placed on nonfinancial performance measures in the compensation contract; OPTIONS the Black–Scholes value of stock option grants as a percentage of total compensation; LEV the ratio of the sum of long-term debt (data #9) and debt in current liabilities (data #34) to total assets (data #6); SIZE the natural log of total assets (data #6); ROA net income (data #172) divided by total assets; CFO the ratio of cash flows from operation (data #308) to total assets; BTM the ratio of total assets to total assets minus book value of equity (data #60) plus market value of equity (product of data #25 and data #199); Sales_Growth the ratio of current sales to lagged sales (data #12); Cashflow_std the standard deviation of operating cash flows over the last 5 years; Income_std the standard deviation of net income over the last 5 years; Sales_std the standard deviation of sales over the last 5 years; and AGE the number of years in which the firm is listed on Compustat.

placed on NFPM in the compensation contract, OPTIONS is the Black–
Scholes value of stock option grants as a percentage of total compensation,
LEV the ratio of the sum of long-term debt (data #9) and debt in current
liabilities (data #34) to total assets (data #6), SIZE the natural log of total
assets (data #6); BTM the ratio of total assets to total assets minus book
value of equity (data #60) plus market value of equity (product of data #25
and data #199); ROA the net income (data #172) divided by total assets,
CFO the ratio of cash flows from operation (data #308) to total assets,
Sales_Growth the ratio of current sales to lagged sales (data #12),
Cashflow_std the standard deviation of operating cash flows over the last
5 years, Income_std the standard deviation of net income over the last
5 years, Sales_std the standard deviation of sales over the last 5 years, and
AGE the number of years in which the firm is listed on Compustat.

Prior research suggests that the use of NFPM is an endogenous choice,
with net benefits varying depending upon several firm characteristics (Said
et al., 2003; HassabElnaby et al., 2005). If endogeneity is found to be related
to NFPM then the OLS estimates will be inconsistent. In the next section,
we discuss in detail how we address the potential endogeneity.

3.5. The Endogeneity of Nonfinancial Performance Measures

In this study, we follow the suggestions of Larcker and Rusticus (2008) to
test whether endogeneity is a problem. Larcker and Rusticus discuss the use
of instrumental variables in accounting research to mitigate endogeneity and
criticize how accounting researchers usually do not test the appropriateness
of the instrumental variables. They suggest that researchers first test whether
the equation system is appropriately identified (i.e., test for overidentifying
restrictions). If the test does not reject the appropriateness of the instru-
ments, it is appropriate to proceed to the Hausman test for endogeneity.

The greatest challenge that researchers face when applying the instru-
mental variables approach is the identification of the proper instruments.
Ideally, the instruments should be based on an inclusive theory of the use of
NFPM. Unfortunately, such a theory is lacking in the accounting literature.
Therefore, we base our choice of the instrumental variables on the extant
literature rather than a comprehensive theory (Said et al., 2003; Ittner &
Larcker, 1997). Based on the current literature, we use the following
variables as instruments: CEO tenure, financial noise, the level of financial
distress, the length of the product development cycle, the length of the

product life cycle, and industry regulation (Ittner et al., 1997; Bushman et al., 1996; Said et al., 2003).

To examine the appropriateness of our instruments we begin with the overidentifying restrictions test. Overidentifying restrictions test is required when the number of instruments is greater than the number of endogenous regressors. In our case, we have six instruments and one potentially endogenous regressor, WNFM. Wooldridge (2002) suggests three steps to perform the overidentifying restrictions test. In the first step, we estimate the potentially endogenous variable, WNFM, as a function of our instruments and all the exogenous variables from Eq. (5) as follows:

$$
\begin{aligned}
\text{WNFM}_{it} = {}& \gamma_0 + \gamma_1 \text{CEO\_TENURE}_{it} + \gamma_2 \text{FINANCIAL\_NOISE}_{it} \\
& + \gamma_3 \text{DISTRESS}_{it} + \gamma_4 \text{DEV\_CYCLE}_{it} \\
& + \gamma_5 \text{LIFE\_CYCLE}_{it} + \gamma_6 \text{UTILITY}_{it} + \beta X + \upsilon_{it}
\end{aligned}
\tag{6}
$$

where CEO_TENURE is the number of years of CEO in position, FINANCIAL_NOISE is the correlation between annual return on assets and annualized monthly stock returns over the 5 years prior to the proxy date, DISTRESS the average of an indicator variable of distress over the 5 years prior to the proxy date. The indicator variable of distress is equal to 1 if the estimated probability of bankruptcy of the Ohlson (1980) Model 1 is at least 0.038 and 0 otherwise; DEV_CYCLE (product development cycle) is an indicator variable that takes on the value of 1 if the firm is classified as having long-term product development cycle and 0 otherwise; LIFE_CYCLE (life development cycle) is an indicator variable that takes on the value of 1 if the firm is classified as having long-term product life cycle and 0 otherwise; UTILITY is an indicator variable that equals 1 if the SIC code is 4911 or 4931 and 0 otherwise; and X is a vector of all other exogenous variables from Eq. (5).

In the second step, we estimate the dependent variable (i.e., proxies for earnings management) as a function of WNFM, the residuals obtained from the first step, WNFM_RESID, and all exogenous variables from Eq. (5) (Wooldridge, 2002, p. 120). In the third step, we regress the residuals from the second step on all exogenous variables (i.e., instrumental variables are included). If the instruments are valid, the coefficients on the instruments should be close to zero. The formal test is based on the R^2 from this model being close to zero. The overidentifying restriction test statistic is calculated as nR^2, where n is the number of observations. The number of observations (n) is distributed χ^2 with $K-L$ degrees of freedom, where K is the number of exogenous variables *unique* to the first stage and L is the number of

endogenous explanatory variables. If the overidentifying restrictions test is not rejected, we proceed to perform the Hausman test for endogeneity, which is simply the significance of the coefficient on the residual in the second stage regression (Wooldridge, 2002).

4. RESULTS

4.1. Endogeneity Diagnostics

Table 2 presents the results of estimating the first stage regression. The positive and significant coefficient on CEO_TENURE indicates that as the

Table 2. First Stage Regression.

Variable	Coefficient	t-Value	p-Value
Intercept	0.2216	1.156	0.249
Instrumental variables			
CEO_TENURE	0.0030	2.877	0.004
FINANCIAL_NOISE	0.0393	1.693	0.092
Distress	−0.1417	−1.199	0.232
Dev_Cycle	0.1894	2.039	0.043
Life_Cycle	−0.2244	−2.900	0.004
UTILITY	0.0008	0.010	0.992
Control variables			
LEV	−0.3994	−2.676	0.008
SIZE	−0.0325	−2.187	0.030
BTM	−0.0031	−0.035	0.972
ROA	0.2329	0.841	0.401
CFO	−0.3999	−1.132	0.259
Sales_Growth	0.0374	0.809	0.420
Cashflow_std	−0.0849	−0.306	0.760
Income_std	0.0335	0.239	0.812
Sales_std	−0.0114	−0.235	0.814
AGE	0.0039	2.682	0.008
Industry controls	Yes		
Year controls	Yes		
Adjusted R^2	0.1714		
F-value	2.23		
Partial F-value	4.25		0.001

Note: See Eq. (6) for the first stage regression.

number of years the CEO has been in position increases, the reliance on the NFPM increases. This result supports the conjecture that the board of directors is better able to evaluate the leadership of a CEO, the quality of his strategic initiatives, his ability to identify growth opportunities, and other qualitative aspects of his performance as his tenure increases without solely relying on financial performance measures (Bushman et al., 1996). We find support for the claim that the use of NFPM is increasing with the extent of noise in financial measures (FINANCIAL_NOISE), consistent with Ittner et al. (1997). The coefficient on DISTRESS is negative but insignificant indicating no difference in the use of NFPM between healthy and distressed firms. Consistent with prior research, the positive and significant coefficient on DEV_CYCLE indicates that firms with longer product development cycles are more likely to use NFPM (Bushman et al., 1996; Said et al., 2003). The negative and significant coefficient on LIFE_CYCLE indicates that firms with shorter product life cycles are making greater use of NFPM, inconsistent with the results in Bushman et al. (1996) on individual measures. Finally, the coefficient on UTILITY is positive but not significant, inconsistent with prior research (Bushman et al., 1996; Ittner et al., 1997; Said et al., 2003).

As suggested by Larcker and Rusticus (2008), we report the partial F-statistic to detect the problem of weak instrumental variables. The partial F-statistic from our first stage of 4.25 is well below the benchmark of F-statistics developed by Stock, Wright, and Yogo (2002) for the number of instrumental variables.[9] This F-statistics indicates that our instruments are weak, which suggests a potential of inferences problem from the two-stage regression. Larcker and Rusticus (2008) provide evidence that the instrumental variables estimates are based on weak estimates and not reliable enough to replace the OLS. Next, we perform the overidentifying restrictions test and the Hausman test for endogeneity.

In Table 3, we report the results of the second stage regression for both absolute discretionary accruals and the absolute performance-matched discretionary accruals. The purpose of these regressions is to perform the Hausman test for endogeneity. However, we must first perform the overidentifying restrictions test because the Hausman test is not valid if the overidentifying restrictions test rejects the appropriateness of the instruments. The overidentifying restrictions test statistics are 4.94 and 4.00 for absolute performance-matched accrual and absolute discretionary accruals regressions, respectively, and both are insignificant. These statistics suggest that the instrumental variables are appropriate and that we can proceed to the Hausman test. The Hausman is simply the test of the

Table 3.   Second Stage Regressions.

Variable	Dependent Variable: APMDA			Dependent Variable: ADA		
	Coefficient	*t*-value	*p*-value	Coefficient	*t*-value	*p*-value
Intercept	0.0756	0.753	0.452	0.0497	1.135	0.258
WNFM	−0.0809	−0.754	0.452	−0.0686	−1.464	0.145
WNFM_RESID	0.0586	0.518	0.605	0.0391	0.792	0.429
LEV	−0.0638	−0.756	0.451	−0.0669	−1.813	0.071
SIZE	0.0073	0.936	0.350	−0.0016	−0.463	0.644
BTM	−0.0244	−0.511	0.610	0.0331	1.583	0.115
ROA	−0.0662	−0.435	0.664	0.1530	2.302	0.022
CFO	0.0529	0.270	0.787	−0.2333	−2.733	0.007
Sales_Growth	0.0198	0.796	0.427	0.0238	2.192	0.029
Cashflow_std	0.3907	2.652	0.009	0.3238	5.032	0.000
Income_std	−0.0293	−0.400	0.689	−0.0041	−0.129	0.898
Sales_std	−0.0372	−1.463	0.145	−0.0186	−1.674	0.095
AGE	−0.0001	−0.120	0.905	0.0004	1.049	0.295
Industry controls	Yes			Yes		
Year controls	Yes			Yes		
Adjusted R^2	0.0949			0.3791		
F-value	1.68			4.98		
Overidentifying restrictions test	4.93		0.424	4.00		0.548

significance of the coefficient on the WNFM_RESID. Since the coefficient on WNFM_RESID is insignificant in both regressions, we fail to reject the null hypothesis of the exogeneity of WNFM. Therefore, we need not pursue 2SLS regressions for estimating the absolute performance-matched accruals and absolute discretionary accruals as a function of NFPM.

In conclusion, we perform the endogeneity diagnostics because the extant literature suggests the use of NFPM is endogenous. We do not find evidence of endogeneity in our tests, but we cannot rule it out. For one, our instruments are weak as evident by the partial *F*-statistics. Unfortunately, we do not have a comprehensive theory on the determinants of NFPM. Richardson (1968) and Sawa (1969) show that the finite sample bias of the instrumental variables estimator is in the same direction as the bias in the OLS estimator, and that bias is exacerbated when the instruments are weak. Therefore, we proceed with reporting the results of the OLS.

Table 4 reports the results of the OLS regressions. In the first panel, we show the results for the absolute performance-matched discretionary accruals. The weight on NFPM (WNFM) is negative and significant at 5%

Table 4. OLS Regressions.

Variable	Dependent Variable: APMDA			Dependent Variable: ADA		
	Coefficient	t-value	p-value	Coefficient	t-value	p-value
Intercept	0.0661	0.998	0.319	0.1101	2.830	0.005
WNFM	−0.0457	−2.222	0.027	−0.0024	−0.201	0.841
OPTIONS	−0.0035	−0.194	0.846	0.0101	0.979	0.329
LEV	0.0539	1.279	0.202	−0.0515	−2.091	0.037
SIZE	0.0082	1.729	0.085	0.0018	0.653	0.514
BTM	0.0217	0.726	0.468	−0.0109	−0.627	0.531
ROA	0.0028	0.039	0.969	−0.1795	−4.432	0.000
CFO	0.0544	0.533	0.595	−0.1068	−1.823	0.069
Sales_Growth	−0.0086	−0.896	0.371	0.0078	1.397	0.164
Cashflow_std	0.2920	3.408	0.001	0.1760	3.297	0.001
Income_std	−0.0353	−0.707	0.480	−0.0213	−0.345	0.730
Sales_std	0.0238	1.965	0.050	−0.0215	−2.523	0.012
AGE	−0.0009	−2.097	0.037	0.0004	1.532	0.127
Industry controls	Yes			Yes		
Year controls	Yes			Yes		
Adjusted R^2	0.1674			0.3228		
F-value	2.70			5.03		

Note: See Eq. (5) for a detailed description of the regression.

level or better. This result suggests that managers of firms that use NFPM in compensation contracts manage earnings less. The magnitude of earnings management decreases as the weight placed on NFPM increases. In the second panel, we show the result for the absolute discretionary accruals. Unlike the performance-matched accruals, the coefficient on WNFM, although negative, is insignificant. The lack of significant result in this panel highlights the importance of controlling for firm performance when calculating abnormal accruals as suggested in Kothari et al. (2005).

5. SUMMARY AND CONCLUSIONS

Earnings management is an area of much interest among researchers and practitioners. The widespread failure in financial reporting has largely been blamed on motivations to manage earnings. Managers have incentives to manipulate earnings for many reasons including compensation. Reward systems based solely on earnings and other financials have been criticized for

encouraging managers to sacrifice long-run performance to increase short-term financial results. To overcome the short-run orientation of financial performance measures, firms are implementing compensation plans that supplement financial metrics with additional NFPM such as the balanced scorecard. Although researchers have argued for the potential of NFPM, there is limited empirical evidence examining the earnings management consequences of using NFPM. This is one of the first studies to empirically examine the relation between the use of NFPM in compensation contracts and earnings management behavior.

This study investigates whether using NFPM aligns the goals of managers with those of the firm and reduces managers' earnings management behavior. The study compares earnings management behavior for firms that use NFPM to those that rely only on financial measures in their compensation contracts. Contingency theories suggest that the choice of appropriate techniques of managerial accounting depends on circumstances surrounding the firm (Gordon & Miller, 1976; Hayes, 1977; Otley, 1980). We test for endogeneity following the procedures suggested in Larcker and Rusticus (2008), and fail to show evidence of the assumed endogeneity.

Using a sample of firms that used NFPM and a control sample of firms that did not rely on NFPM in their compensation during the period 1992–2005, the study provides justifications for the managerial accrual choices as explained by the use of NFPM. Our findings support the contention that firms that employ a combination of financial and NFPM have significantly lower levels of earnings management. Specifically, there is strong evidence indicating a negative relation between the use of NFPM and performance-matched discretionary accruals.

The results in this study require careful interpretation. The results reflect a more general voluntary disclosure phenomenon. In our sample, firms chose whether to use and whether to disclose the use of NFPM, whether to link them to managers' incentives, and determine their own corporate governance structures. As pointed out in Core (2001), the simultaneous choice of disclosure, incentives, and corporate governance structure is an interesting question for future research.

Future research should more closely examine the specific type of NFPM that contribute less to earnings management. For instance, are there certain combinations of nonfinancial and financial measures that optimize the efficacy of NFPM and lead to less earnings management? Also, are there certain combinations of NFPM attributes and weights that best maximize the inherent potential of NFPM? Another avenue for future research is to experimentally test the effect of NFPM on earnings management to better

determine and understand the causal relationship between the combined strategies and managerial choices. Moreover, future research may examine the role, if any, of using NFPM on the quality of earnings as explained by earnings manipulation behavior.

NOTES

1. See Fields et al. (2001) and Healy and Wahlen (1999) for a review of this literature.

2. The number refers to the number of customers whose level of satisfaction exceeds a certain number.

3. Sweeney (1994) assumes that earnings management is costly in the context of examining managers' reaction to debt covenant violations (p. 284). Zang (2007) explicitly tests the cost of earnings management as a determinant of switching between real and accrual earnings management. She argues that accrual management is costly primarily due to auditor and regulators' scrutiny and litigation risk.

4. For example, Ittner et al. (1997) report that 114 of the 317 firms in their sample employ nonfinancial measures in evaluating CEO performance.

5. Nonfinancial measures are also subject to manipulation through real earnings management activities. Ittner and Larcker (2003) indicate it is not surprising that nonfinancial measures are susceptible to manipulation as financial accounting.

6. In our sample the weight placed on earnings in the bonus contracts is significantly lower for our treatment group (i.e., firms that use NFPM) than for our control group (i.e., firms that do not use NFPM). For the treatment group, the weight placed on earnings is about 11% of the total compensation, while for the control group that weight is 18% (the difference between the two groups is significant at 1% level, t-value = 5.50).

7. For example, "non-financial or nonfinancial," "customer satisfaction," "employee satisfaction or employee morale or employee motivation," "quality," "process improvement," "re-engineering or reengineering," "new product development," "diversity," "market share," "productivity or efficiency," "safety," "innovation," "corporate restructuring activities", "operational measure or operational performance," "product and services innovation," "alliances with other organizations," "community involvement, and "strategic objectives."

8. In our sample, 9.5% of the treatment sample assigned weight to nonfinancial sample but did not disclose the specific nonfinancial performance measures. From the firms that disclosed the specific nonfinancial measure (90.5%), 6.2% used only strategic nonfinancial measures (e.g., corporate restructuring activities, product and services innovation, alliances with other organizations, and community involvement), while 84.3% disclosed both strategic and nonstrategic nonfinancial measures (e.g., safety, cycle time, on-time delivery, defect rates). The weight assigned to strategic nonfinancial measure is 89% of total weight assigned to nonfinancial performance measures.

9. Per Stock et al. (2002), when the number of instrumental variables is five, the suggested critical F-statistic should be 15.09. In our test, we include six instrumental variables in the first stage.

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QUANTIFYING THE IMPACT OF COST ACCOUNTING SYSTEM DESIGN ON MANUFACTURING PERFORMANCE: A SIMULATION APPROACH

Robert Hutchinson

ABSTRACT

This study examines the impact of three cost accounting system (CAS) designs – traditional costing, activity-based costing, and time-based accounting – on manufacturing performance as measured in terms of demand fulfillment rate, cycle time, and net operating income – within a flexible, pull-production environment. A simulation approach allows for the direct comparison of these CAS designs under various scenarios. The introduction of supply and demand stochasticity, along with differing levels of product mix complexity modeled in environments with differing levels of manufacturing overhead burden, adds practical significance to the results. The fact that no single CAS outperformed along all performance measures has considerable implications for management accounting practice vis-à-vis manufacturing strategy, in particular for competitors in time-based industries. Also, this is the first known study to operationalize and test the theoretical time-based accounting

methodology, further validating the efficacy of simulation methodologies
in cost management contingency research.

INTRODUCTION

Traditional accounting research methodologies have struggled to provide meaningful assessments of different cost accounting system (CAS) designs and their real impact on manufacturing performance. This is particularly true with regard to theoretical and company-specific CAS designs not widely found in practice. Case studies have the potential to provide richer insights into more sophisticated CAS designs (Al-Omiri & Drury, 2007); however, these insights are often difficult to apply universally.

Kaplan (1999) predicted that new research in high-payoff management accounting topics will require a very different set of research methodologies than have been used in the past:

> Traditional social science research methods, such as empirical analysis of large data sets, analytic models of accepted and understood phenomena, and cross-sectional field research, can be effective for studying the universe as it now exists, for understanding "what-is". But, these normal science methods are less helpful for management accounting research where major social structural changes are occurring in organizations and in the roles performed by cost accounting systems within these organizations.

This study carries on Kaplan's prediction, making several contributions to the field of management accounting research. Methodologically, it utilizes computer simulation to directly compare three different CAS designs – traditional costing systems (TCS), activity-based costing (ABC), and time-based accounting (TBA) – in a controlled experimental environment. Simulation allows for the isolation and quantification of the impact of CAS design on key manufacturing performance measures (MPM) in terms of demand fulfillment rate (DFR), cycle time (CT), and net operating income (NOI). Incorporating these key MPM from operations management gives real-world validity to the findings. According to Kaplan and Cooper (1998), the only valid measure of improved CAS design is increased performance of the entire manufacturing system, not simply more accurate product costs. Moreover, this study serves as further validation of the efficacy of simulation methodologies in cost management contingency studies.

While simulation is a long-established methodology in operations management, it is far from widespread in the management accounting literature.

Cost management contingency studies utilizing simulation methodologies are just as likely to be found in the operations management literature. These studies often test rudimentary costing schemes within relatively complex operating environments (e.g., Boyd & Cox, 2002; Lea & Fredendall, 2002; Lea & Min, 2003; Özbayrak, Akgün, & Türker, 2004). Conversely, the few simulation studies found in the management accounting literature often focus on more sophisticated CAS designs, albeit within rather simplistic operational contexts (e.g., Leitch, 2001; Balakrishnan & Sivaramakrishnan, 2002; Banker & Hansen, 2002; Leitch, Philipoom, & Fry, 2005).

This study bridges this gap between the operations management and management accounting. From a theoretical perspective, it incorporates key factors influencing performance from operations management – product mix complexity (MIX) and manufacturing overhead (MOH) levels – in order to build a more valid, multidimensional model. It also adds the complication of a product mix decision having three different products with three different cost structures in the context of a capacity-constrained manufacturing environment. Moreover, this study is the first known to test the theoretical TBA technique (Hutchinson, 2007), bridging the gap between descriptive and normative accounting research.

RESEARCH FRAMEWORK AND HYPOTHESES

The experimental research framework in Fig. 1 shows the hypothesized relationship between the CAS design and the product mix decision (PMD).
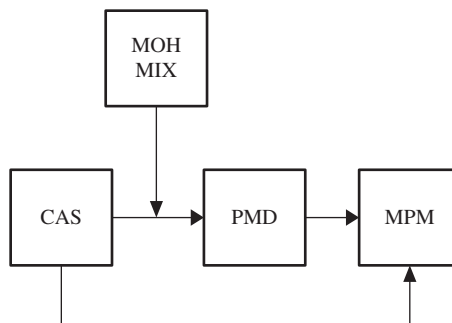
Fig. 1. Experimental Research Framework.

This relationship is mediated by the level of MOH and MIX. The PMD and the CAS together affect the MPM defined in terms of DFR, CT, and NOI.

Cost Accounting System

If management can measure costs correctly, they will make better decisions (Cooper & Kaplan, 1988). A firm calls upon its CAS both in strategic and tactical planning, as well as in the costing of production. This means that CAS design directly affects PMDs as well as MPM, that is, through the costing of production ex post facto. Therefore, it is a major concern of management to design an appropriate CAS that derives the most profitable PMD where capacity constraints exist, minimizes cycle times, and maximizes demand fulfillment in a given manufacturing context.

The management accounting literature, however, presents conflicting evidence regarding the importance of CAS design with regard to manufacturing performance. On the one hand, empirical evidence supports the importance of CAS design vis-à-vis manufacturing systems. Firms that have incorporated key MPM in their CAS designs show greater profitability (Chenhall, 1997). Overall congruence between the CAS and the manufacturing process is crucial to optimal system performance (Sim & Killough, 1998). The degree to which firms implement advanced manufacturing systems, such as just-in-time, is related to the degree to which performance measures are reflected in the CAS design (Fullerton & McWatters, 2002).

However, the literature shows that the majority of manufacturing firms, roughly 75%, continue to use TCS designed for another era of manufacturing (PriceWaterhouse, 1989; Drury & Tayles, 1997; Fry, Steele, & Saladin, 1998; Garg, Ghosh, Hudick, & Nowacki, 2003; Sharman, 2003; Al-Omiri & Drury, 2007). While some operations management scholars have gone so far as to call cost accounting "enemy number one to factory productivity" (Goldratt & Cox, 1992), one survey of 130 U.S. manufacturing companies provides evidence that CAS design rarely reflects differences in strategy, operating environment, or competitive pressures (Hughes & Paulson Gjerde, 2003). Clearly there is a need to isolate and quantify the real impact of CAS design on manufacturing performance. In order to clarify this impact, the following hypothesis is tested:

H1. The use of different CAS has a significant effect on manufacturing performance.

The three CAS designs considered in this research are TCS, ABC, and TBA. For a detailed explanation of these designs and how they are operationalized see Section Simulation Model Logic.

Manufacturing Overhead

A central issue in all CAS designs remains the allocation of overhead to different products, and this contentious issue continues to be debated by accountants decades after indirect costs were first recorded (Zimmerman, 2009, pp. 313–319). Ever-rising levels of MOH have long been considered the primary driver of cost distortion and have led to the development of ABC. If MOH were a negligible portion of total product cost, misapplication of MOH would not be a concern (Ruhl & Bailey, 1994). However, in practice MOH has grown to become the single largest product cost component in most modern manufacturing plants. In general, the higher the overhead rate for a company, the greater the amplification of the difference in costs between TCS and ABC. Vokurka and Lummus (2001) demonstrate this effect in a scenario experiment where the same product manufactured in two different plants with differing levels of overhead burden is costed significantly different under TCS and ABC as the overhead burden increases from 6% to 40%. The difference in product cost between the alternatives increases from only 4.1% under the lowest burden rate up to 26.1% at the highest level.

ABC has been purported to be an overall better MOH allocation technique, but this is largely contingent upon the percentage of MOH in total production costs and the percentage that can be allocated by specific activities. Per the authors, companies above a certain ratio of overhead to total cost may benefit from adopting ABC; however, it may not be wise for a company with a low overhead burden or a single product line to adopt ABC because of the cost of implementation. The higher the percentage of MOH not allocated by assigned activities, the more the allocation will reflect what could have been calculated through TCS. As a general guideline, the authors suggest that MOH begins to drive significantly different product costing under TCS and ABC at levels greater than 15% of total product cost and when at least 70–75% of MOH can be assigned to specific products. Based on this evidence, the following research hypotheses are tested:

H2$_a$. The level of MOH has a significant amplification effect on manufacturing performance.

H2$_b$. The use of different CAS under differing levels of MOH has a significant effect on manufacturing performance.

Product Mix Complexity

It is not uncommon in today's competitive environment for a firm's product line to contain a mix of both high- and low-volume products produced within a single facility. In most cases, the high-volume products tend to have a steady demand, utilize cheaper standardized parts, require little marginal overhead support, and traditionally have had lower profit margins reported under TCS. Alternatively, low-volume products tend to have higher demand variation, utilize more expensive and specialized parts, require a great deal of overhead support, and traditionally have had higher profit margins under TCS.

MIX has been generally acknowledged as one of the primary drivers of manufacturing cost and cost distortions (Kaplan, 1983; Cooper & Kaplan, 1988). MIX is examined via three different products under differing levels of demand variability and with bill-of-material (BOM) structures. The three products examined are (A) a high-volume product with a narrow BOM, (B) a mixed-volume product with a mixed BOM, and (C) a low-volume product with a wide BOM. Accordingly, the following research hypotheses are tested:

H3$_a$. MIX has a significant effect on manufacturing performance.

H3$_b$. The use of different CAS under differing levels of MIX has a significant effect on manufacturing performance.

H3$_c$. The use of different CAS under differing levels of MOH and differing levels of MIX has a significant effect on manufacturing performance.

METHODOLOGY FOR TESTING HYPOTHESES

Simulation as a Method of First Resort

Increasingly researchers give less credence to the pejorative description of simulation as a "method of last resort." Much to the contrary, simulation is quickly becoming a method of first resort due to the sheer complexity of systems of interest and the models necessary to represent them in a credible and valid way (Law & Kelton, 2000). Simulation studies use hyperphysical companies in purposefully designed and controlled experiments, where the

scale, processing times, and other settings are carefully designed to examine both extreme pathological and normal scenarios. Results demonstrate generalizable patterns and trends over a broad decision space (Lea & Fredendall, 2002).

There are many reasons for choosing a simulation instead of an analytical approach, although there is a tradeoff. A simulation model deals better with the complexity of stochasticity, while analytical model affords greater precision (Leitch, 2001). Much of the value of mathematical models comes from their precision, not their accuracy or practical application (Forrester, 1961). Much of the research on push production systems has been analytical and based on queuing theory, but in the pull-production environment even apparently simple systems are often difficult to analyze analytically (Buzacott & Shanthikumar, 1993; Leitch, 2001; Hayes, Pisano, Upton, & Wheelwright, 2005). Thus, simulation may be the most effective methodology for investigating cost management contingencies within complex production environments (Leitch, 2001).

The introduction of supply and demand stochasticity allows for a more realistic analysis. While many cost management studies have traditionally assumed deterministic production environments, dependent and stochastic events such as arrival and processing times are present in all production environments. While common belief suggests that such variations may average out over time, research suggests that they can accumulate, compounding scheduling problems and leading to delays and congestion on the plant floor (Banker, Datar, & Kekre, 1988; Goldratt & Cox, 1992; Ruhl & Bailey, 1994; SMA 4HH, 1999; Leitch, 2001).

The use of simulation mitigates two design issues in particular that long plagued cost management contingency research. First is the difficulty in identifying innovative CAS designs in practice and operationalizing them for research. This is especially true for survey studies where companies report using a particular design, such as ABC. It is often difficult to determine to what extent ABC has been implemented and if the researcher is getting a true and valid comparison. Survey research often leads to a tautological paradox, in that respondents are often keenly aware that ABC is supposed to lead to greater performance and therefore have the tendency to give the ''correct'' response. The advantage of a simulation approach in this context is patently clear, in that the research analyst explicitly defines the parameters for all variables.

Another issue that has proven problematic to cost management contingency research is the difficulty in extracting the effects of CAS design on performance from other events that might be associated with

performance (Al-Omiri & Drury, 2007). Simulation allows for the direct comparison and quantitative measurement of variables in a controlled environment, effectively eliminating the effects of extraneous factors not of interest to the researcher.

Select Simulation Studies in the Literature

Although long established in operations management and industrial engineering, simulation is an emergent methodology in management account-ing research. Its acceptance is increasing but widespread in the management accounting literature by any measure. The following studies compare various accounting schemes in a simulated manufacturing environment.

In the management accounting literature, Leitch (2001) examines the tradeoffs between various cost drivers (stochasticity, capacity, and lead-time constraints) and its effects on strategic cost management. Balakrishnan and Sivaramakrishnan (2002) determine the relationship between product pricing, production capacity, and allocation decisions, finding that flexible capacity mitigates the potential perverse incentives of full costing on production capacity and allocation decisions. Banker and Hansen (2002) compare three pricing heuristics in a service operation, finding that full costing provided optimal performance when demand is greater than capacity in a service operation where there is soft capacity in the form of backordered service. Leitch and others (2005) evaluate full-cost heuristics under different levels of stochastic demand: lead-time, cost structure, and work station capacity. They found that full costing works well when lead ties are long and shop capacity is balanced.

The operations management literature has also examined CAS design using simulations. Boyd and Cox (2002) compare TCS, ABC, direct costing, and throughput accounting (TA) in a theory of constraints (TOC) context. They found that TA produced the same results as a linear programming model, while all others produced suboptimal results. Lea and Fredendall (2002) examine TCS, ABC, and variable costing in a highly automated manufacturing environment, that is, with a high level of MOH. They compare these accounting schemes under different product structures finding that no single CAS design performs best under all shop settings. Lea and Min (2003) repeated this simulation comparing the same CAS designs in both a just-in-time and TOC environment with different planning horizons. They found that the CAS that best depicts the manufacturing process provides better product cost information and results in better system

performance. Özbayrak and others (2004) compare TCS and ABC in a highly automated manufacturing setting. They found that a pull strategy gives consistently better operational results, regardless of the CAS design, but is optimized in conjunction with ABC.

While all of the aforementioned studies have made significant contributions to our understanding of cost contingency theory, in terms of developing a knowledge base in simulation, there is still a need for a great deal of work in this bourgeoning field. Many of these earlier contributions make assumptions that simplify the analysis at the expense of practical application. For example, in Leitch (2001) and Leitch and others (2005), the plant only manufactures two homogenous products selling at the same price. The current study, on the other hand, uses three products with different BOM, plant routings, and margins for the product mix decision. In addition, this study is of a flexible manufacturing system that is constantly under stress with demand in excess of supply and no queuing of orders.

Simulation Model Logic

The simulation model in this study is developed and executed within Rockwell Automation's Arena software, one of the most powerful commercially available simulation tools in the market today. Arena is a highly flexible and endlessly reconfigurable tool, which allows the research analyst to create an animated simulation model representing virtually any system, build in complex underlying costing and decision logic submodels, and statistically analyze the results of system input modifications.

The experimental research design includes three experimental factors – three CAS designs, three levels of MIX, and three levels of MOH. For each performance measure, the experimental design is a 3×3 full factorial with 60 replications, thus resulting in a total of 1,620 ($3 \times 3 \times 3 \times 60$) observations. The experimental design is thus:

$$
\begin{aligned}
Y_{\text{aom}} = {} & \mu + \text{CAS}_a + \text{MOH}_o + \text{MIX}_m \quad \text{(Main effect)} \\
& + \text{CAS}_a \times \text{MOH}_o + \text{CAS}_a \times \text{MIX}_m + \text{MOH}_o \times \text{MIX}_m \\
& \text{(Two-way interaction)} \\
& + \text{CAS}_a \times \text{MOH}_o \times \text{MIX}_m \quad \text{(Three-way interaction)} \\
& + e_{\text{aom}}
\end{aligned}
$$

where Y_{aom}, performance measurements; μ, mean effect; CAS_a, cost accounting system effect, $a = 1, 2, 3$; CAS_1, TCS; CAS_2, ABC; CAS_3, TBA;

MOH_o, manufacturing overhead level effect, $o = 1$, 2, 3; MOH_1, low; MOH_2, medium; MOH_3, high; MIX_m, product mix complexity effect, $m = 1$, 2, 3; MIX_1, narrow; MIX_2, medium; MIX_3, wide; e_{aom}, random effect.

Defining the Experimental Factors

CAS is the primary factor under examination. Table 1 summarizes the product and period cost classifications under the three CAS designs. The first column identifies the common manufacturing and selling, general, and administrative (SG&A) activities. The second column shows the cost associated with each activity followed by the classification and basis for absorption under each of the CAS designs. Manufacturing activities such as raw material purchases, direct labor, and direct manufacturing costs are variable in respect to production volume and will be collected over the course of the simulation runs. Other costs are fixed or semivariable in nature and make up the classifications of MOH and SG&A.

Because budgeting and cost control are not of interest in this study, actual costing is utilized. This simplifies the accounting complexity at the end of each period and avoids tracking variances and adjustments. The accounting period for this study is set to 1 month (30 days), with all performance measures collected at the end of each period.

The cost of raw materials is designed to reflect the greater percentage of standardized and nonstandardized parts used in high-volume, simple products and low-volume, complex products, respectively. Table 2 outlines the costs for the individual parts used in this study.

In practice, MOH is frequently accumulated by department and then allocated to products using a predetermined allocation rate. In this study, TCS and TBA will allocate these costs based on the percentage of total direct labor hours and average CT to each product class, respectively. Alternatively, ABC treats all costs as product costs and attempts to fully allocate all overhead costs by their individual activity drivers. It is rarely possible to accurately trace 100% of MOH to specific activity drivers and then allocate it to specific products by those drivers (Vokurka & Lummus, 2001; Kaplan & Anderson, 2004). Therefore, miscellaneous MOH will be allocated by a single generic basis, the measure of an individual product's percentage of total production volume.

Under TCS and TBA, all SG&A are treated as period costs. Under ABC, these costs are also treated as product costs and are allocated to the product by their individual activity drivers. Again, because it is rarely possible to

Table 1. Product and Period Cost Classifications by Cost Accounting System.

Cost Classification		Amount			ABC	TBA	TCS
Manufacturing direct							
Direct materials		Varied with production volume and collected from simulation			P (actual cost)	P (actual cost)	P (actual cost)
Direct labor					P (actual cost)	P (actual cost)	P (actual cost)
Depreciation (machinery)					P (actual cost)	P (actual cost)	P (actual cost)
Manufacturing overhead costs		Low	Medium	High			
General		24,400	37,700	53,200	P [1]	MOH (by throughput time)	MOH (by labor hours)
Quality control		1,340	1,444	1,653	P [2]	MOH (by throughput time)	MOH (by labor hours)
Production supervision		4,200	6,300	8,400	P (time/product)	MOH (by throughput time)	MOH (by labor hours)
Utilities		4,500	6,750	9,000	P (actual usage)	MOH (by throughput time)	MOH (by labor hours)
Miscellaneous		1,000	1,000	1,000	P (sales volume)	MOH (by throughput time)	MOH (by labor hours)
Selling, general, and administrative							
R&D – basic			1,200		P (time/product)	Period cost	Period cost
Customer support			7,400		P [3]	Period cost	Period cost
General administration			4,200		P (sales volume)	Period cost	Period cost
Advertising costs – product	A		1		P (actual cost)	Period cost	Period cost
	B		2		P (actual cost)	Period cost	Period cost
	C		4		P (actual cost)	Period cost	Period cost
Commission	A		5		P (actual cost)	Period cost	Period cost
	B		10		P (actual cost)	Period cost	Period cost
	C		20		P (actual cost)	Period cost	Period cost

ABC, activity-based costing; TBA, time-based accounting; TCS, traditional costing system.

Table 2. Material Purchase Prices.

Item Number	Associated with Product(s)	Cost/Unit
110	B & C	$20
220	A & B	$10
230	C	$25
240	C	$25
250	C	$25
260	C	$25

accurately trace all overhead costs to individual activity drivers, general administrative costs are allocated by a single generic basis, the measure of an individual product's percentage of total production volume.

Under ABC, for the sake of simplicity and generalizability, it is necessary to make certain assumptions in the cost model. This experiment assumes that all the activities shown in Fig. 1 are primary activities that include all the costs of any secondary activities. The following formula is used to absorb the MOH costs to an individual product:

$$R_{k,i} = C_k \frac{Q_i \times N_i}{\sum_{i=1}^{m} Q_i \times N_i} \tag{P1}$$

where $R_{k,i}$, amount of cost k allocated to product i, $i = 1, 2, 3$; C_k, $k = 1$ (finished goods storage), 2 (depreciation), 3 (data entry), 4 (cost analysis), 5 (production engineering), 6 (scheduling); Q_i, production quantity of product i; N_i, total number of parts in product i; m, number of products, $m = 3$.

Quality control costs per period include prevention, appraisal, and internal failure costs. For the purposes of this study, it is assumed that all products passing inspection are good products and therefore the external cost of failure is irrelevant. The activity driver associated with quality control under ABC is the actual number of occurrences weighted by a product's predetermined quality multiplier. The multiplier is selected to reflect the average time needed to inspect and either repair or reject the final product. The following formula is used to absorb the cost of quality control to an individual product:

$$X_i = \text{Quality cost} \frac{A_i \times \text{AQ}_i}{\sum_{i=1}^{m} (A_i \times \text{AQ}_i)} \tag{P2}$$

where X_i, quality control cost allocated to product i; AQ_i, number of defects for product class i; A_i, quality multiplier for product i; m, number of products, $m = 3$.

Customer support is the general cost of providing service to customers after the sale. Similar to the quality control costs, the activity driver associated with service under ABC is the actual number of occurrences weighted by a product's predetermined service multiplier. The multiplier is selected to reflect the average time needed to service a customer by product. The following formula is used to absorb the service costs to an individual product:

$$Y_i = \text{Service cost} \frac{B_i \times \text{BQ}_i}{\sum_{i=1}^{m}(B_i \times \text{BQ}_i)} \tag{P3}$$

where Y_i, service cost allocated to product i; BQ_i, actual service calls for product class i; B_i, service multiplier for product i; m, number of products, $m = 3$.

MOH has long been considered the primary amplifier of cost distortion and has led to the development of ABC. MOH has grown to become the single largest product cost component in many modern industries. In general, the higher the overhead rate for a company, the greater the amplification of the difference in costs between CAS designs.

Using a similar methodology as Vokurka and Lummus (2001), total MOH burden will be set at three levels – low ($\approx 10\%$), medium ($\approx 20\%$), and high ($\approx 40\%$). The current study assumes any statistically significant trend toward greater cost distortions will continue as MOH increases.

MIX is defined as the breadth of different products – with varying levels of width in the BOM for each product – produced at one factory. MIX has been generally acknowledged as one of the primary drivers of manufacturing cost and a primary cause of cost distortions. MIX will be examined via three different products under differing levels of demand variability. The three products examined are (A) a high-volume product with a narrow BOM, (B) a mixed-volume product with a mixed BOM, and (C) a low-volume product with a wide BOM.

It is not uncommon in today's competitive environment for a firm's product line to contain a mix of both high- and low-volume products produced within a single facility. In most cases, the high-volume products tend to have a steady demand, utilize cheaper standardized parts, require little marginal overhead support, and have traditionally had lower profit margins reported under TCS. Alternatively, low-volume products tend to have higher demand variation, utilize more expensive and specialized parts, require a great deal of overhead support, and traditionally have had higher profit margins under TCS. The three products examined in this study are

Table 3. Product Characteristics.

	A	B	C
Volume	High	Medium	Low
Demand variation	Low	Medium	High
Overhead usage	Low	Medium	High
Main type of parts used	Standard	Mixed	Nonstandard
Profit margin under TCS	Low	Medium	High
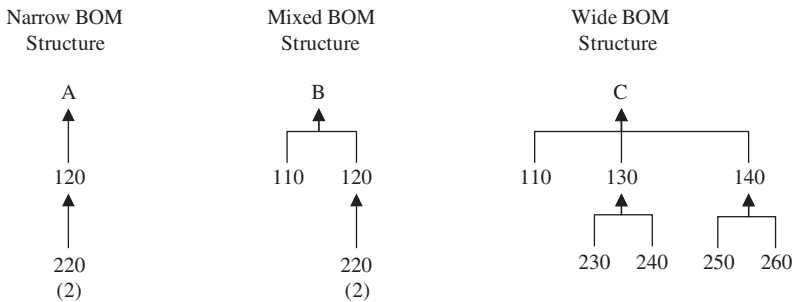
Fig. 2. BOM Structure by Product.

designed to reflect these characteristics in both their demand variability and BOM structures. Table 3 summarizes the characteristics of the products used in this study.

The mix of differing levels of BOM structure is designed to examine the frequent claims in the literature that high-volume, simple products often subsidize low-volume, complex products under TCS. Traditionally, high-volume products typically are allocated a greater share of MOH than what they marginally drive. This is due mainly to the use of volume measures such as direct labor hours or machine hours. Conversely, low-volume products often bear a share of MOH burden considerably less than what they marginally contribute. Fig. 2 shows the BOM structures of the product produced in this study.

For the purposes of this study, we assume that the market is nearly perfectly competitive, that is, there are many producers and sellers, and total industry capacity is roughly equal to total demand. In this scenario, prices are market driven and any individual firm cannot affect the overall market price, that is, the firm is a "price taker." The selling price in this study is set at $100 for product A, $160 for product B, and $360 for product C.

However, at a micro level the individual firm operates in a constrained environment where it has insufficient production capacity to meet its individual market demand. Demand not satisfied by the individual firm is immediately lost to other firms in the market. In this environment, variations in product cost caused by different CAS alternatives may result in different product mix decisions that in turn lead to different manufacturing performances. The plant routings are presented in Fig. 3.

PMD is represented by a decision logic submodel in Arena. An integer linear program maximization formulation determines the optimal product mix for the master production schedule as follows:

$$\text{Maximize } Z = \sum_{j=1}^{n} c_j^{l,k} x_j$$

$$Z = \sum_{j=1}^{n} a_{ij} x_j \leq b_i \quad i = 1, 2, 3, \ldots, m \text{ (Resource/capacity constraint)}$$

$$x_j \geq d_j \quad \text{for every } j, \ j = 1, 2, 3, \ldots, n \text{ (Market demand constraint)}$$

$$x_j \geq 0$$

where x_j is the number of product j produced; b_i the maximum amount of resource i available; d_j the market demand for product j; a_{ij} the amount of resource i required to produce product j; c_j^{lk} the contribution margin of product j, with complexity k, under CAS_1 and with $m + n$ constraints for this model.

Performance Measures

DFR is defined as the percentage of demand for the three individual products that is accepted for production. This represents one of two nonfinancial measures for manufacturing performance and the primary market measure used in this study.

CT is the ultimate measure of performance in today's increasingly time-based competitive environment (Blackburn, 1991; Koufteros, Vonderembse, & Doll, 1998). CT is measured in this study from the time an order is accepted until it is shipped to the customer. CT has become an important aspect of customer service, and must be managed via the CAS (Leitch, 2001; Hutchinson, 2007).

NOI is the most utilized measure of performance in the accounting literature, and is defined as sales from operations for the accounting period less cost of goods sold and SG&A. As this study will simulate a

Product A
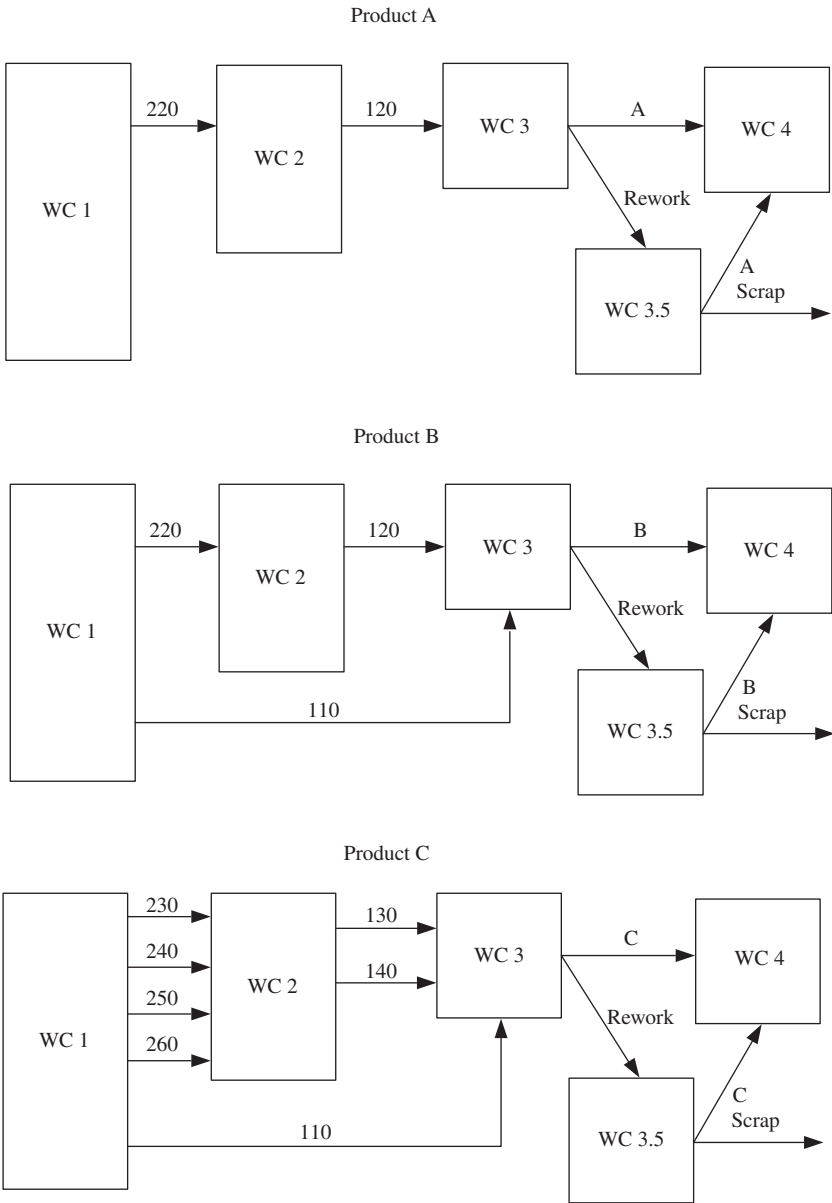
Product B

Product C

Fig. 3.   Product Routings.

make-to-order shop, with no finished goods inventory, there is no concern for short-term timing differences between the various CAS alternatives under examination.

RESULTS

The initial data were uploaded into SPSS for statistical analysis. A multivariate analysis of variance (MANOVA) was performed to determine whether a factor and/or its interaction is statistically significant in determining overall performance. The results were further analyzed using univariate analysis of variance (ANOVA) post hoc tests.

Effect size measures of the degree of association between the effect, either the main effect or any interaction effects, and the dependent variable (DV). It is the proportion of variance in the DV that is attributable to each effect, and is an important measure for sensitivity analysis in simulation studies. There are several commonly used measures for effect size, the most common being eta squared (η^2) and partial eta squared (η_p^2). One of the problems with η^2 is that the values of each effect are dependent upon the number of other effects and their magnitude. η_p^2 presents an alternative computation of η^2 for each individual effect and is defined as $\eta_p^2 = \mathrm{SS}_{\mathrm{effect}}/(\mathrm{SS}_{\mathrm{effect}} + \mathrm{SS}_{\mathrm{error}})$, where SS is sum of squares. The η_p^2 values are not additive, that is, they do not sum the amount of DV variance accounted for by the independent variables and the sum of values may be greater than 1.

The η_p^2 values presented below in Fig. 4 demonstrate a high effect size for all three experimental factors (main effects), especially for CAS and MIX, which explains 81% and 96% of the variability in the DV, respectively. MOH was associated with 49% of the variability in the DV, which – although low relative to the other two main effects – demonstrates a highly significant relationship.

The η_p^2 values presented below in Fig. 5 demonstrate a high effect size for the two-way interaction of CAS and MIX and a significant, albeit it is rather low, effect size for MOH and MIX. The amount of variance in the DV combination explained by these interactions was 73% and 7%, respectively. The two-way combination of CAS and MOH as well as the three-way interaction of CAS, MOH, and MIX were insignificant with less than 1% in effect size.

MANOVA results in Table 4 indicate that CAS, MOH, and MIX all significantly affect the DV. In addition, the bivariate combinations of CAS and MOH, CAS and MIX, and MOH and MIX are all found to

SS$_{error}$
19%

SS$_{error}$
51%

SS$_{error}$
4%

SS$_{MAS}$
81%

SS$_{MOH}$
49%

SS$_{MIX}$
96%
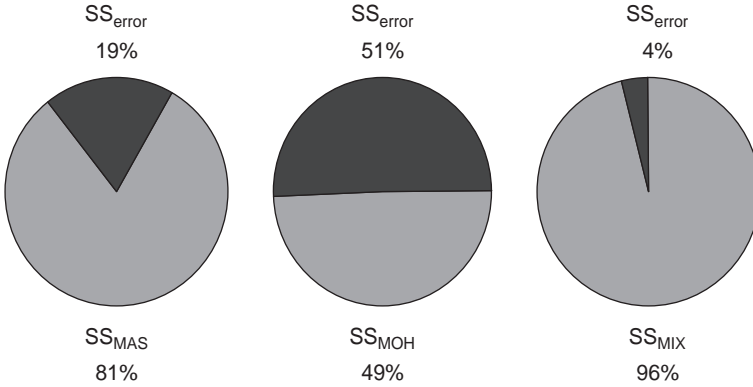
Fig. 4.   Partial Eta Squared Values for Main Factors.

SS$_{error}$
99%

SS$_{error}$
27%

SS$_{error}$
93%

SS$_{MAS*MOH}$
1%

SS$_{MAS*MIX}$
73%

SS$_{MOH*MIX}$
7%
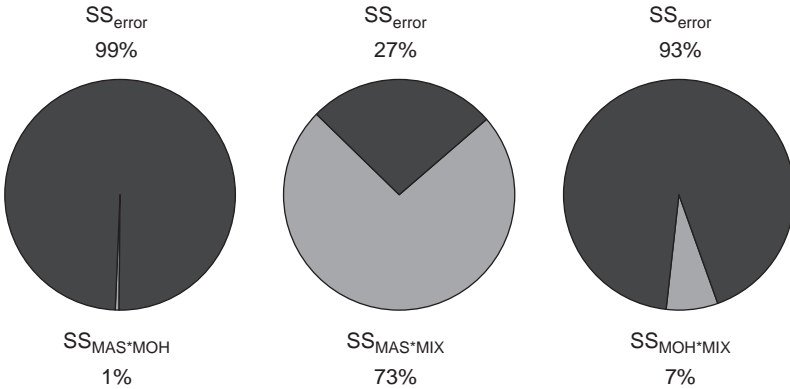
Fig. 5.   Partial Eta Squared Values for Interaction Effects.

significantly affect the DV. However, multivariate effect sizes are small for the combinations of CAS and MOH as well as the combination of MOH and MIX. The three-way interaction of CAS, MOH, and MIX were not found to significantly affect on the DV. This may be explained by the nature of MOH, which amplifies the impact of the two other factors.

Univariate ANOVA and Scheffé post hoc tests indicate that DFR differs significantly by CAS, MIX, and the two-way interaction of CAS and MIX. CT differs significantly by CAS, MIX, and the two-way interaction of CAS and MIX. NOI differs significantly for individual factors and two-way

Table 4. Multivariate Tests.

Effect	Pillai's Trace	F	Hypothesis df	Error df	Significant	Partial Eta Squared
Intercept	1.000	23,118,783.276[a]	3.000	1,591.000	0.000	1.000
CAS	1.621	2,268.712	6.000	3,184.000	0.000	0.810
MOH	0.984	514.306	6.000	3,184.000	0.000	0.492
MIX	1.925	13,603.070	6.000	3,184.000	0.000	0.962
CAS × MOH	0.019	2.552	12.000	4,779.000	0.002	0.006
CAS × MIX	2.200	1,095.489	12.000	4,779.000	0.000	0.733
MOH × MIX	0.220	31.495	12.000	4,779.000	0.000	0.073
CAS × MOH × MIX	0.020	1.343	24.000	4,779.000	0.122	0.007

Design: Intercept + CAS + MOH + MIX + CAS × MOH + CAS × MIX + MOH × MIX + CAS × MOH × MIX.
[a]Exact statistic.

interactions and moderately in the three-way interaction of CAS, MOH, and MIX.

MOH had an amplification effect only and therefore did not significantly affect the performance variables other than NOI. This was not a completely unexpected result and supports the findings of Vokurka and Lummus (2001). Post hoc Scheffé tests show significant differences between the three levels of MOH and NOI. MOH did not have a significant impact on the other two measures of manufacturing performance (DFR and CT), nor do any of its interactions significantly affect DFR or CT. The two-way interactions and three-way interaction of MOH with the other factors all had an insignificant affect on DFR and CT. Table 5 presents the summary of the between-subjects effects for this model.

Table 6 presents the results of this study in terms of these three MPM by CAS design and combined weighted score. The combined weighted score is a composite measure of the three primary MPM, whereby two points are assigned to the best performing CAS, one point to the second best performance, and zero points to the least performance. Therefore, a perfect score of 6 would indicate that the CAS scored the highest along all three MPM. As demonstrated, no single CAS design excelled across all three measures, indicating that each alternative has its own limitations in terms of performance that must be considered in decision making.

Fig. 6 shows that all three CAS designs performed nearly equally well in terms of DFR when MIX was low. As MIX increased, all three saw a decrease in DFR. However, the falloff in DFR occurred at a far greater rate under TCS as compared to the other two CAS designs. Although ABC

Table 5. Test of Between-Subjects' Effects.

Source	Dependent Variable	Type-III Sum of Squares	df	Mean Square	F	Significant	Partial Eta Squared
Corrected model	DRF	62.838[a]	26	2.417	148,280.04	0.000	1.000
	CT	45,262,856.302[b]	26	1,740,879.089	1,761.51	0.000	0.966
	NOI	465,888.411[c]	26	17,918.785	4,264.884	0.000	0.986
Intercept	DRF	1,053.052	1	1,053.052	64,607,878.4	0.000	1.000
	CT	466,080,178.361	1	466,080,178.361	471,603.687	0.000	0.997
	NOI	12,157,090.348	1	12,157,090.348	2,893,532.45	0.000	0.999
CAS	DRF	9.459	2	4.729	290,159.665	0.000	0.997
	CT	1,898,679.810	2	949,339.905	960.591	0.000	0.547
	NOI	14,321.816	2	7,160.908	1,704.381	0.000	0.682
MOH	DRF	1.254E−06	2	6.272E−07	0.038	0.962	0.000
	CT	27.157	2	13.578	0.014	0.986	0.000
	NOI	266,950.628	2	133,475.314	31,768.716	0.000	0.976
MIX	DRF	47.978	2	23.989	1,471,806.22	0.000	0.999
	CT	41,027,206.507	2	20,513,603.254	20,756.71	0.000	0.963
	NOI	171,831.926	2	85,915.963	20,449.024	0.000	0.963
CAS × MOH	DRF	3.661E−06	4	9.152E−07	0.056	0.994	0.000
	CT	23.795	4	5.949	0.006	1.000	0.000
	NOI	85.047	4	21.262	5.061	0.000	0.013
CAS × MIX	DRF	5.401	4	1.350	82,837.117	0.000	0.995
	CT	2,336,834.240	4	584,208.560	591.132	0.000	0.597

			df		F	Sig.	
MOH × MIX	NOI	11,417.652	4	2,854.413	679.384	0.000	0.630
	DRF	7.801E–07	4	1.950E–07	0.012	1.000	0.000
	CT	21.054	4	5.264	0.005	1.000	0.000
	NOI	1,197.652	4	299.413	71.264	0.000	0.152
CAS × MOH × MIX	DRF	7.380E–06	8	9.225E–07	0.057	1.000	0.000
	CT	63.738	8	7.967	0.008	1.000	0.000
	NOI	83.690	8	10.461	2.49	0.011	0.012
Error	DRF	2.596E–02	1,593	1.630E–05			
	CT	1,574,342.494	1,593	988.288			
	NOI	6,692.942	1,593	4.201			
Total	DRF	1,115.916	1,620				
	CT	512,917,377.157	1,620				
	NOI	12,629,671.701	1,620				
Corrected total	DRF	62.864	1,619				
	CT	46,837,198.796	1,619				
	NOI	472,581.353	1,619				

[a] $R^2 = 1.000$ (adjusted $R^2 = 1.000$).
[b] $R^2 = 0.966$ (adjusted $R^2 = 0.966$).
[c] $R^2 = 0.986$ (adjusted $R^2 = 0.986$).

Table 6. Summary of Cost Accounting System Performance by Experimental Condition Group.

MOH Level	MIX Level	Performance Measure											
		Demand fulfillment rate			Cycle time			Net operating income			Combined weighted score (maximum 6)		
Low	Low	1	ABC	99.8%	1	TBA	304.91	1	ABC	86.188	1	ABC	5
		2	TBA	99.6%	2	ABC	305.13	2	TCS	85.660	2	TBA	3
		3	TCS	99.2%	3	TCS	326.38	3	TBA	85.603	3	TCS	2
Low	Medium	1	ABC	91.6%	1	TBA	549.88	1	ABC	105.922	1	ABC	4
		2	TBA	89.1%	2	TCS	698.46	2	TCS	101.416	2	TBA	3
		3	TCS	72.6%	3	ABC	745.55	3	TBA	101.405	3	TCS	2
	High	1	ABC	68.5%	1	TCS	608.89	1	ABC	115.412	1	ABC	4
		2	TBA	67.5%	2	TBA	619.20	2	TBA	103.579	2	TBA	3
		3	TCS	37.7%	3	ABC	670.13	3	TCS	101.771	3	TCS	2
	Low	1	ABC	99.8%	1	TBA	304.91	1	ABC	78.087	1	ABC	5
		2	TBA	99.6%	2	ABC	305.13	2	TCS	77.803	2	TBA	3
		3	TCS	99.2%	3	TCS	325.38	3	TBA	77.480	3	TCS	1
Medium	Medium	1	ABC	91.6%	1	TBA	548.21	1	ABC	100.462	1	ABC	4
		2	TBA	89.1%	2	TCS	698.46	2	TCS	95.799	2	TBA	3
		3	TCS	72.6%	3	ABC	745.55	3	TBA	95.319	3	TCS	2
	High	1	ABC	68.5%	1	TCS	608.89	1	ABC	112.319	1	ABC	4
		2	TBA	67.5%	2	TBA	619.15	2	TBA	98.462	2	TBA	3
		3	TCS	37.7%	3	ABC	670.13	3	TCS	96.620	3	TCS	2
	Low	1	ABC	99.8%	1	TBA	304.91	1	ABC	53.781	1	ABC	5
		2	TBA	99.6%	2	ABC	305.46	2	TCS	53.507	2	TBA	3
		3	TCS	99.2%	3	TCS	326.38	3	TBA	53.258	3	TCS	1
High	Medium	1	ABC	91.6%	1	TBA	548.88	1	ABC	76.283	1	ABC	4
		2	TBA	89.1%	2	TCS	698.46	2	TCS	72.467	2	TBA	3
		3	TCS	72.6%	3	ABC	745.89	3	TBA	71.352	3	TCS	2
	High	1	ABC	68.5%	1	TCS	608.89	1	ABC	89.038	1	ABC	4
		2	TBA	67.5%	2	TBA	618.94	2	TCS	74.866	2	TCS	3
		3	TCS	37.7%	3	ABC	670.13	3	TBA	74.744	3	TBA	2

MOH, manufacturing overhead level; MIX, level of product mix complexity; TCS, traditional costing systems; ABC, activity-based costing; TBA, time-based accounting.
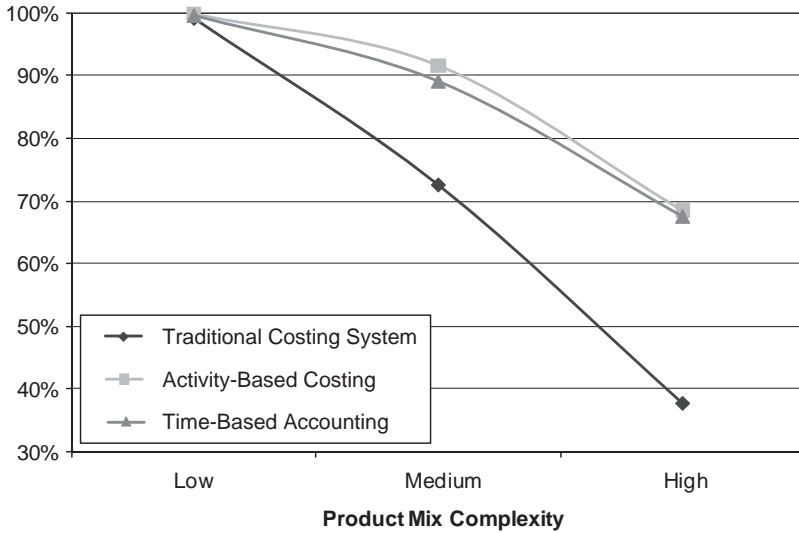
Fig. 6. Average Demand Fulfillment Rate by Cost Accounting System.

performed the best across all levels of MIX, TBA performed nearly as well along this crucial customer service measure and may not present any significant difference in practice.

Fig. 7 shows that TBA performed the best in nearly all settings, driving a product mix decision that better balanced the manufacturing line and resulted in the lowest CT for all products. It is interesting to note that ABC, which generally outperformed along the other two MPM, was least effective in terms of CT. This is particularly significant as, according to some operations management scholars, "Time accounting is more important than cost accounting" (Hayes et al., 2005). Also, the variability of CT across the various levels of MIX was much less than the variability under the TCS and ABC. This may have important implications for the time-based competitor concerned with consistently delivering faster cycle times under varying levels of MIX demanded by the market. While this study assumed the firm was a price taker, case studies suggest that time-based manufacturers command a higher pricing structure in the long run (Blackburn, 1991).

An argument could certainly be made that NOI is the most important measure of the three, that is, the "bottom line." Fig. 8 shows that ABC clearly outperformed the two other designs along this measure. TCS and TBA performed nearly equally well under low- and medium-demand settings
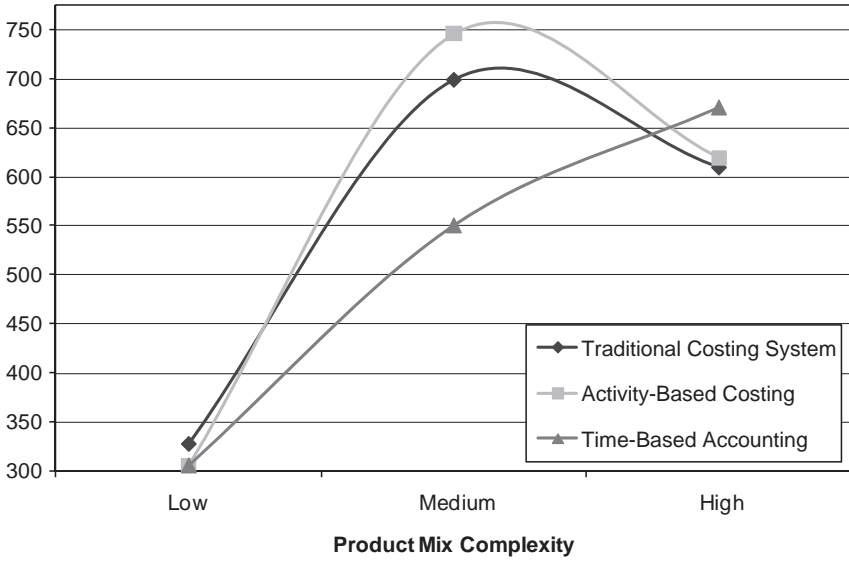
Fig. 7.   Average Cycle Time (Minutes) by Cost Accounting System.
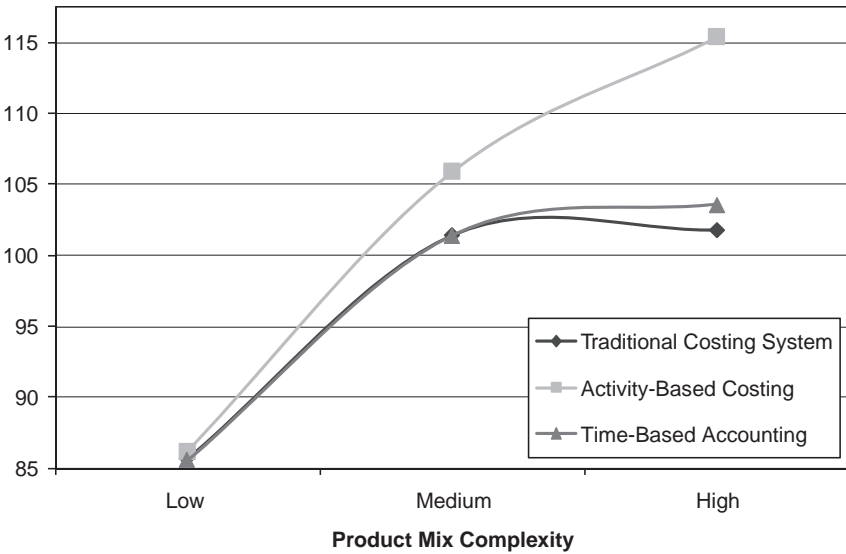
Fig. 8.   Average Net Operating Income by Cost Accounting System with Low
Manufacturing Overhead Level.
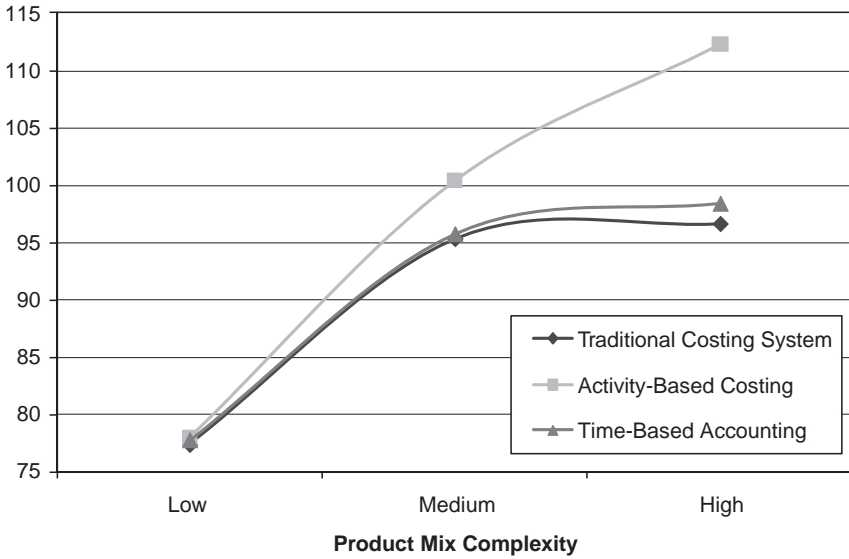
Fig. 9. Average Net Operating Income by Cost Accounting System with Medium Manufacturing Overhead Level.

for MIX. However, as MIX increases, TCS begins to fall behind TBA. These results are consistent with the results of Vokurka and Lummus (2001).

Fig. 9 shows essentially the same results, with ABC clearly outperforming the other two CAS designs. The difference between TCS and TBA again is not as great under medium levels of MIX but increases with high levels of MIX.

Fig. 10 shows very similar results, with ABC clearly outperforming the other two alternatives. Overall, average NOI is at its lowest given the higher levels of MOH. The difference between TCS and TBA again is not as great under medium levels of MIX but increases with higher levels.

DISCUSSION AND CONCLUSION

Limitations and Suggestions for Research

While this study demonstrates that CAS design does have a significant impact on manufacturing performance, it is important to remember that every research methodology has its own unique set of strengths and
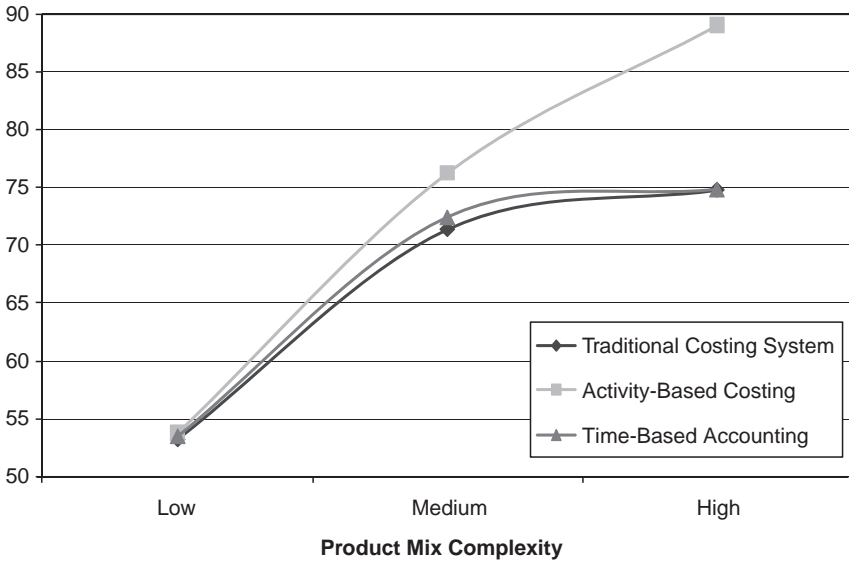
Fig. 10. Average Net Operating Income by Cost Accounting System with High
Manufacturing Overhead Level.

corresponding limitations. These limitations support the need for additional
studies using a simulation approach. One of the limitations of this study is
that it presents one type of operating context and therefore may not be
generalizable across all manufacturing environments. It is suggested that
this experiment be repeated using different types of manufacturing settings,
from job shops to continuous flow processes.

   With any form of analytical model, assumptions must be made in
order to generate a solution. This particular study assumed that there
were no changes in products demanded or in pricing over a 5-year period.
The implications being that unfulfilled demand had no effect on future
demand distributions. This is a particularly important point for the
so-called time-based manufacturer, as evidence suggest that delivering
products with greater speed allows for premium pricing and leads to greater
demand for goods and services (Blackburn, 1991). Future studies should
take a system dynamics approach (Forrester, 1961) incorporating feedback
loops to assess costing dynamics and their long-term impact on demand and
pricing.

In financial terms, this study followed many others in using NOI as the primary performance measure. However, this also makes a rather questionable assumption that the cost of implementation and ongoing cost of maintenance for the different CAS designs are equal. This assumption may be the source of disconnect between management accounting research that touts the benefits of ABC and the failure of ABC to take root in practice.

For all the hype it received since the 1980s, few firms have actually adopted ABC and those that have largely abandoned it. One study found 60% of firms reporting that they have experimented with ABC and two-thirds of those have already abandoned the effort (Grasso, 2005). With the decline in popularity of ABC, some are pointing toward prohibitively high costs to implement and maintain such systems as the source of failure (Kaplan & Anderson, 2004). Future survey research should try to quantify the costs of implementation and maintenance for ABC systems, and future simulation studies should use this information to calculate some form of return-on-investment when comparing CAS designs.

Implications for Practice and Research

The results of this study present particularly interesting implications for management accounting practice. Increasing competition drives demand for more complex and higher priced products, which presents an opportunity for increased revenues. The paradox is that these products often drive higher overall manufacturing costs. Higher levels of MOH had no significant effect on the product mix decision; however, total costs between the various CAS designs were amplified. The implication for management accountants is that CAS design becomes increasingly important as MIX increases, and the effects may be amplified as MOH levels increase.

This study also demonstrated that more accurate cost information is not necessarily better, as no single CAS design outperformed along all performance measures. While ABC drove higher NOI, the benefits may not justify the costs of implementation and ongoing maintenance, particularly in instances where product mix variability is low. ABC offered no significant difference in terms of DFR from the other two designs, and its performance on CT was significantly less than TBA. Clearly, a one-size-fits-all mentality regarding CAS will no longer suffice in today's competitive environment, and the field of cost management contingency theory remains fertile ground for future research applying simulation methodologies.

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HOW DECISION PREFERENCE IMPACTS THE USE OF PERSUASIVE COMMUNICATION FRAMES IN ACCOUNTING

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ABSTRACT

Capital budgeting decisions frequently go awry. We investigate whether the party gathering the data utilizes persuasive communications when presenting the information to a superior. Specifically, we analyze whether the information is framed differently depending on his or her opinion. Since prior research has shown that differential framing of the same information affects decisions this may be one contributor to capital budgeting failures. We found that participants did frame the information differently depending on whether they chose to accept or reject the project. Our control group, no decision required, was materially different from the reject group but not materially different from the accept group.

INTRODUCTION

Capital budgeting decisions are among the most important decisions made by an organization. These decisions generally involve the commitment of a large amount of money for a long period, and hence are pivotal in assuring the organization's long-term success (Clancy, Collins, & Chatfield, 1982). Despite the importance of capital budgeting decisions, research sponsored by the Corporate Executive Board (2003) reports that 40% of incremental capital budgeting projects perform below expectations and nearly 90% of discontinuous projects suffer the same fate. Boulding, Morgan, and Staelin (1997) report that capital budgeting decisions related to new products have maintained an average failure rate between 35 and 45% for the past 25 years, and this rate has not changed with the addition of more advanced and technologically sophisticated forecasting tools (Schmidt & Calantone, 2002).

Many researchers and practitioners suggest that political tactics play an important role in the failure rates of capital budgeting decisions (Eisenhardt & Zbaracki, 1992; CEB, 2003). Practitioners have noted the importance of personality and persuasion in the capital budgeting process (Orme, Parsons, & Baxter, 1993; Steele & Albright, 2004), and Ancona and Caldwell (1992) note the importance of lobbying and impression management in new product development scenarios. Researchers have further suggested that capital budgeting decisions are strongly influenced by informal information networks involving primarily low- and mid-level managers (Hirst & Baxter, 1993; Hopwood, 1976). In fact, research suggests that upper management is often limited in their ability to reject capital budgeting projects because of organizational momentum toward acceptance (Clancy & Collins, 1979). As the number of managers endorsing the project grows, the social cost of rejecting the project at upper levels of the organization also grows. Because of this phenomenon, Hopwood (1976) considers the capital budgeting process more ritualistic than rational, and Hirst and Baxter (1993) compare the formal decision process to a "rubber stamp." The importance of this informal information system may also facilitate other behavioral factors in these decisions; behavioral researchers have specifically found opportunism (Ho & Vera-Munoz, 2001) and affect (Kida, Moreno, & Smith, 2001) to have a significant influence on capital budgeting decisions.

While organizational momentum and other behavioral factors can greatly influence capital budgeting decisions, these difficulties generally start with internal communications. Research in multiple contexts suggest that the way information is communicated or *framed* impacts the way decision makers

interpret and use the information (Levin, Schneider, & Gaeth, 1998; Dunegan, 1993; Kida, 1984). This impact could be even greater in the capital budgeting context, with informal discussions and decisions often overriding the more rational, but ultimately ritualistic, formal decision process. However, these potentially biased communications need not start with a manager seeking to "sell a pet project," but rather could relate to the underlying nature of the capital budgeting decision process. Specifically, managers are accountable for the decisions and recommendations they make to upper management. Research suggests that having a decision rejected by upper management can have serious reputation effects for managers and represent a "slap in the face" (Hopwood, 1976; Clancy et al., 1982). This research stream suggests that whenever individuals make a decision or have a preference, they develop an emotional investment in the outcome of the decision and will seek to defend their position to others. In fact, these effects can be seen to generalize across many decision-making contexts. Accountants' role in a capital budgeting decision typically involves identifying, gathering, summarizing, and communicating financial and nonfinancial information regarding a potential project. Accountants may also be explicitly asked to indicate their preference regarding the potential project (e.g., accept or reject). Even impartial accountants are human, and if they have developed an investment preference it is likely they will seek to defend their own recommendation when communicating with superiors.

The current study investigates whether individuals utilize persuasive communications when required to make an investment decision and present investment-related information for management review. Specifically, we predict that a decision makers' recommendation regarding a capital budgeting project will impact the way they describe (positively versus negatively) the project. To analyze this hypothesis a research case was developed. This case asked graduate-level business students to consider three financial indicators relating to a capital budgeting proposal. Each information item presented included frequency information concerning the number of Monte Carlo simulations above and below a predetermined company benchmark. Participants then made an accept/reject decision for the investment opportunity and were asked to summarize the investment information for management review.

The results of the study support our expectation and show that individuals' accept/reject recommendations regarding an investment opportunity influenced how they communicate the information regarding the investment. Specifically, participants who chose to reject the investment

decision framed more accounting information in terms of failure than did participants who chose to accept the investment. Our results also show that when participants chose to reject the investment they framed more information negatively when compared to a no-decision control group, and differences between the accept and no-decision groups were insignificant. These findings are important in an accounting context because prior research has consistently shown that decisions are influenced by the way information is presented (i.e., framed). Levin et al. (1998) summarizes this research stream across various disciplines. The results of the current study are especially important for managerial accounting, as management accountants are responsible for identifying, interpreting, and communicating information within the organization (Institute of Management Accountants, 1981). From the perspective of the capital budgeting decision process, persuasively communicating project information could contribute to project "momentum," and may ultimately result in the "rubber stamp" of approval for a faulty capital budgeting project.

This study contributes to our understanding of the capital budgeting decision process both theoretically and practically. While previous research suggests that these decisions involve political tactics and the use of persuasion (Eisenhardt & Zbaracki, 1992; Orme et al., 1993), this is the first study to analyze the use of persuasive communication frames in the capital budgeting process. In fact, this is the first study to analyze communication framing behaviors in a specifically managerial accounting context. Understanding what motivates positive and negative descriptions of information is important because a large amount of research in both accounting and psychology suggest that these different description styles impact decisions and decision makers (O'Clock & Devine, 1995; Levin & Gaeth, 1988). The results of this study also have practical implications for business and accounting professionals. Our findings suggest that if an individual (i.e., communicator) is asked to provide his or her opinion and to summarize accounting information it is likely the manner in which the information is presented will be affected by the communicator's opinion. This persuasive communication framing is particularly likely when the communicator's opinion is negative (e.g., reject an investment). Our lack of findings for undisclosed preferences suggests the use of communication frames will not be affected by a communicator's opinion if his or her opinion is not requested. Finally, users of managerial accounting information should be aware that there is a general tendency to communicate information in a positive manner (Wang, 2004; van Schie & van der Pligt, 1990; Elliott & Archibald, 1989).

The remainder of this paper is organized as follows. The next section reviews the relevant literature and presents the study's research hypothesis. Then we describe the research methodologies employed and present the results of our analysis. The concluding section discusses the study's contributions to the literature, implications for practice, suggestions for future research, and limitations of the current study.

PRIOR LITERATURE

The importance of behavioral factors in capital budgeting decisions has long been recognized (Clancy et al., 1982). These decisions are extremely complex and require considerable estimation with respect to cash flow timing and amounts (Clancy et al., 1982), and therefore, they lack the objectivity that quantitative calculations of net present value and internal rate of return might suggest. In addition, the capital budgeting decision process is also riddled with behavioral peculiarities. Hopwood (1976) notes for instance, that capital budgeting decisions are rarely made in formal organizational channels, as formal proposals are virtually always accepted (also see Hirst & Baxter, 1993). Rather, these decisions are made informally with low- and mid-level managers seeking to avoid the embarrassment of having a project rejected by superiors and upper-level managers, while these same upper-level managers are often limited in their ability to reject formal capital budgeting proposals once the level of support voiced by low- and mid-level managers reaches a critical mass (Clancy et al., 1982).

The nature of the capital budgeting decision process highlights the important role accountability plays in these decisions. The importance of superior opinion with regards to manager recommendations suggests that managers may seek to justify their opinions and recommendations when communicating accounting information within the organization. Past accounting research suggests that incentives and preferences, such as that presented in the capital budgeting process, play a vital role in internal communication. Sridhar (1994), for instance, analytically models the impact of reputation effects on internal communication. His findings suggest that less talented managers are likely to distort internal communications to hide their inability by emphasizing projects that would limit comparisons between themselves and high talent managers. Rich, Solomon, and Trotman (1997) propose a similar outcome in the audit context. They theorize that auditors are likely to use persuasive communications in working papers to emphasize their own preferences. Specifically, they believe auditors come

to an initial decision and frame or "stylize" information to induce reviewer agreement with their decision. Taken together, the nature of the capital budgeting decision process, along with the conclusions of Sridhar (1994) and Rich et al. (1997), suggests that managers and accountants are likely to communicate information in ways that support and justify their own recommendations and opinions.

Research in psychology further suggests that these stylized or framed statements have the potential to impact decisions. Research on these effects has shown that when a decision maker considers information described positively he or she will often come to a different decision than when the same information is described negatively. Tversky and Kahneman (1981) provide a popular example of these framing effects, as they present decision makers with a disease scenario that threatens the lives of 600 individuals. Participants were asked to choose between two public health options that were framed either in terms of the number of lives saved or the number of lives lost. Tversky and Kahneman (1981) find that choices differ considerably between the two frames, as individuals in the positive frame (lives saved) tend to be risk averse, while individuals in the negative frame (lives lost) tend to be risk seeking. This work has been extended to various types of decisions in both basic and applied fields (Levin, 1987; Duchon, Dunegan, & Barton, 1989; Brockner, Wiesenfeld, & Martin, 1995), and positive and negative frames have been shown to affect both novice and expert decision makers (Dunegan, 1993). Levin et al. (1998) summarize a large body of research regarding these framing effects and suggest that frames focus the decision maker's attention on either the chance of a positive outcome (e.g., lives saved) or the chance of a negative outcome (e.g., lives lost) causing more optimistic or pessimistic evaluations and decisions.[1]

Accounting researchers have also noted the potential impact of stylized or framed communications. In general, this research provides subjects with equivalent information that is described either negatively or positively and then investigates the effect the *frame* or description has on decisions. Research in managerial accounting has primarily considered the impact information frames have on manager decisions. Specifically, Rutledge and Harrell (1993, 1994) find that information frames impact managers' tendencies to invest additional money into a risky investment (i.e., escalate on investments). They conclude that negative frames (potential losses) cause increased escalation, and positive frames (potential savings) reduce escalating behaviors. Rutledge (1995) also analyzes the impact of information framing on recency effects in managerial decisions. He finds that counterbalancing information order with information frames mitigates the

impact of recency on manager budgeting decisions. Finally, Luft (1994) broadens the decision-making role to consider employee acceptance of contractual incentives. She finds that incentive contracts framed in terms of bonuses rather than penalties result in increased willingness to adopt. This research clearly shows that framed or stylized information can have a consistent and robust impact on decisions in a managerial accounting context.

The research on framing effects in the accounting domain suggests that *externally provided descriptions* have a powerful impact on manager decisions. However, little research to date has investigated whether accountants frame the information they are communicating to others, and if so, how accountants choose the frame to use. This lack of research in the area of communication frames is not particular to the accounting literature. While a vast amount of research has considered the impact of externally provided frames on decision makers (see Kuhberger, 1998; Levin et al., 1998 for reviews), relatively little work has considered how information is framed when being shared among decision makers (Wang, 2004). This lack of research is startling, considering that most framing research depends on information frames being introduced into the decision-making process.

While research on the way communicators choose to describe information is limited, research in psychology suggests that people prefer to describe information positively, rather than negatively (Wang, 2004; van Schie & van der Pligt, 1990; Elliott & Archibald, 1989). This literature, however, is limited in its applicability to business decisions, which involve a much more complex and fluid context (Puto, 1987; Lipe, 1993). To our knowledge, Shankar and Tan (2006) is the only study that has examined the impact decisions have on communication framing behavior. They find marginal support ($p = 0.069$ two tailed) that auditors with high tacit managerial knowledge frame evidence consistent with their conclusions when required to justify them to a reviewer with similar preferences.[2] These findings provide specific support to the theoretical relationship proposed by Rich et al. (1997) in the auditing context and suggests incentives and preferences impact accounting communications.

Although sparse, this literature suggests that when communicating information about a capital budgeting decision, managers are likely to frame their communications based on accept/reject decision. The suggestions of Sridhar (1994), Rich et al. (1997), and the findings of Shankar and Tan (2006) suggest that accountants' decisions and preferences will result in persuasive communications aimed at increasing the likelihood of superior endorsement of their decision or preference. The research of Hopwood

(1976) further supports this notion, as managers seeking to avoid the embarrassment of having a superior reject a project they support are likely to use persuasive communication to decrease the likelihood of rejection by the superior. Based on this work, we expect the decision makers' accept or reject decision for a potential investment to determine whether the capital budgeting information is described positively or negatively.

> **Hypothesis.** When accountants' decision is to accept (reject) an investment, the accounting information related to the project will be described with positive (negative) frames rather than negative (positive) frames.

RESEARCH METHODOLOGY

Research Case

The research case asked participants to consider a capital budgeting proposal. The proposal included a description of the investment decision process, a summary of the three financial indicators considered in making investment decisions (Net Present Value, Payback Period, and Accounting Rate of Return), and raw output from a fictitious Monte Carlo simulation for each of the relevant indicators. One version of the case (see Appendix A) asked participants to consider the capital budgeting proposal, indicate whether they would accept or reject the investment, summarize the investment information for management consideration, and provide demographic information. The design required participants to determine their own opinion about the investment before they were asked to frame the accounting information to be given to management. As research suggests (Hopwood, 1976; Clancy et al., 1982) having a decision rejected by upper management represents a "slap in the face" for employees and can have serious effects on their reputation. Therefore, requiring the investment decision first in our case should cause the participants to feel a need to support/justify their decision. This design provides the opportunity to analyze how investment preference impacts the use of persuasive communication frames.[3] The second version of the research case (see Appendix B) was utilized for a control group. This version asked participants to consider the capital budgeting proposal, summarize the investment information for management consideration, provide demographic information, and then indicate at the very end of the case whether they would accept or reject the investment. The inclusion of a control group allows us to investigate the

framing behavior of participants that were not required to disclose an investment preference. This permits us to compare the use of persuasive communication by individuals that feel the need to justify/support their decision because they disclosed to management their investment decision before summarizing the information versus individuals that do not feel this need because they did not disclose to management their investment decision prior to summarizing the information. Also, having participants make an invest/reject decision at the very end of the case allows us to examine in our supplemental analysis whether participants' framing behavior was affected by an undisclosed investment accept or reject decision. In other words, the control group version allows us to investigate whether participants generated an accept/reject preference prior to summarizing the financial information even though they were not asked to in the case. To our knowledge, no previous research has examined the potential affect of undisclosed preferences on individuals' use of persuasive communication frames.

The capital budgeting proposal described a new product line that was being considered for distribution. The task description emphasized the company's goal of expansion and revenue growth, and further described the investment consideration process. Specifically, all participants were told that while the company had always considered reliable financial indicators of project success, they were now taking increased care to consider the uncertainty and risk involved with estimates utilized in calculating these indicators. At that point, the Monte Carlo simulation process was explained to the participants. All participants were told that Monte Carlo simulation techniques were used by the company to account for fluctuations in uncertain estimates, such as the timing and amounts of future cash inflows and outflows. The computer output provided by the Monte Carlo simulations was then briefly described.

Next, the three financial indicators considered in making capital budgeting decisions were identified and described. All participants were then presented with the Monte Carlo computer output for each indicator. The output included the company goal for the measure, the expected value (average of all simulations), the number of individual simulations considered, and frequency information comparing individual simulation outcomes to the company goal. For instance, participants received Net Present Value output that included the company goal of zero or above, the overall mean for all simulations of $2.50, and frequency information indicating that 4,900 individual simulations were above zero and 5,100 individual simulations were below zero. We chose to present the number of

Monte Carlo simulations above the specified goal before the number of simulations below the goal to provide a more natural reading case. Also, if anything, presenting the number of simulations first should only serve to bias us against finding results because it decreases the likelihood of participants utilizing negative frames when summarizing the financial information. Based on the provided information, participants, excluding those in the control group, made an accept/reject decision. All participants were then asked to summarize the financial information. For each of the three financial indicators participants were asked to provide the relative likelihood information concerning the relationship between the simulations and the company goal. This summarization procedure was used to measure communication framing and was tailored to induce either positive or negative frames. Specifically, subjects filled in the missing information in the following statement concerning the relative likelihood information, "Based on the Monte Carlo procedure, ____% of the [specific financial information item] simulations were _____." To prevent this statement from alerting participants to the dependent variable, the expected value for each measure was also requested in the form of a statement. All participants were then asked to provide any additional written comments they may have had and to provide demographic information. Finally, participants in the control group made an accept/reject decision at the end of the case.

Independent and Dependent Variables

The research design was based on decision preferences and communication frames. The independent variable of decision preference consists of three groups: participants that chose to accept the investment, participants that chose to reject the investment, and participants that were not asked to make an investment decision before summarizing the financial information (control group). Some participants were randomly assigned to the control group. The other participants, based on their perceptions of the information provided, self-chose into the accept group or reject group based on their response to a single item asking whether they would recommend that management accept or reject the potential investment. The dependent variable was determined based on the labels used to summarize the relative likelihood information pertaining to the financial indicators. Labels emphasizing the simulations above the company goal were coded as positive and given a value of one. Labels emphasizing the simulations below the company goal were coded as negative and given a value of zero. The positive

and negative codes were summed across the three financial indicators to determine the overall frame sum score for each participant (ranging from zero to three). To investigate the use of persuasive communication frames, the frame sum scores for participants accepting the investment were compared to the frame sum scores for the participants rejecting the investment.

Participants

Participants were masters-level business students from three public universities in the eastern United States. Participants included both Masters of Business Administration (MBA) students and Masters of Accounting (MACCT) students. A total of 179 research cases were collected and analyzed.[4] A general breakdown of the demographic characteristics of these participants is provided in Table 1. As shown in the table, participants had an average of 4.21 years of business experience and an average graduate grade point average (GPA) of 3.63. Subjects also had a firm grasp of financial concepts with an average of 5.37 h of undergraduate and 2.92 h of graduate finance, as well as an average of 4.19 h of undergraduate and 2.82 h of graduate managerial accounting. In addition, gender was approximately equal in the sample, with 96 (53.6%) males and 83 (46.4%) females. Finally, with respect to the investment preference, 61 (34.1%) participants accepted the potential investment, 68 (38.0%) rejected the investment, and 50 (27.9%) were not required to make an investment decision prior to summarizing the financial information (control group).

RESULTS

Primary Analysis

Communication frame was identified as either positive (1) or negative (0) for each of the three financial information items included in the case.[5] These coded information items were then summed to determine the frame sum score for each participant. The mean frame sum for each participant group is given in Table 2.

Past research suggests that positive frames will generally be employed more often than negative frames (Wang, 2004). To determine whether our results are consistent with this research, we compared the mean frame sum score for

Table 1.   Sample Descriptive Statistics.

	N^a	Mean	SD
Years of business experience	172	4.21	5.611
Graduate GPA	146	3.63	0.295
Undergraduate finance hours	169	5.37	6.494
Graduate finance hours	172	2.92	2.467
Undergraduate managerial accounting hours	164	4.19	2.988
Graduate managerial accounting hours	165	2.82	2.290

	Count	Percentage (N = 179)
Gender		
Male	96	53.6%
Female	83	46.4%
Investment preference		
Accept investment	61	34.1%
Reject investment	68	38.0%
No decision (control group)	50	27.9%

[a]Final sample consisted of 179 participants. "N" not equal to 179 indicates some participants failed to provide information.

Table 2.   Frame Sum[a] Means and Standard Deviations across Groups.

Decision Preference[b]	N	Mean	Standard Deviation
Accept	61	2.72	0.777
Reject	68	1.47	1.376
Control	50	2.64	0.851
Total	179	2.22	1.211

[a]Each of the three financial information items summarized by participants were identified as either positively framed or negatively framed. Positive frames were given a value of one and negative frames were given a value of zero. The frame sum score is the sum of participants' three items.
[b]The decision preference variable consists of three groups: participants that chose to accept the investment, participants that chose to reject the investment, and participants that were not required to make an accept/reject decision (control group).

the control group to the midpoint (1.50) of the frame sum score range (0–3). Results indicate that the mean frame sum (2.64) is significantly higher than the midpoint ($p < 0.001$, two tailed). In other words, subjects tended to use the positive frame more often than the negative frame. In the absence of needing

to support/justify a decision, this finding supports previous psychology research that positive frames are employed more often than negative frames when describing information.[6] We next investigated the use of persuasive communication frames when participants were asked to make an investment decision and then provide information for management.

We hypothesized that framing tendencies would be largely based on investment decisions because participants would feel a need to support/justify their decision.[7] Hence, if the decision maker accepts (rejects) an investment, he or she is more likely to frame the accounting data positively (negatively) rather than negatively (positively). To test this hypothesis, we performed a one-way analysis of variance (ANOVA) with decision preference (accept, reject, control) as the sole independent variable and frame sum as the dependent variable. The ANOVA table is presented in Panel A of Table 3.

As shown in Panel A of Table 3 there is a significant difference (p-value <0.001, one tailed) between at least two of the three participant groups. We performed three t-tests comparing means to identify which groups differ. The results of the comparisons are displayed in Panel B of Table 3. The mean difference of 1.25 between participants that chose to accept the investment and those that chose to reject the investment is significantly different

Table 3. One-Way Analysis of Variance and Comparisons between Groups.

Panel A: One-way analysis of variance with decision preference as the independent variable and frame sum score as the dependent variable[a]

Source	df	Mean Square	F-score	p-value
Between groups (decision preference)	2	31.169	27.605	<0.001[b]
With groups	176	1.129		
Total	178			

Panel B: t-tests comparing mean frame sum scores between decision preference groups[a]

Comparison	Mean Difference	t-score	p-value
Accept group vs. control group	0.08	0.525	0.600
Reject group vs. control group	1.17	5.304	<0.001
Accept group vs. reject group	1.25	6.256	<0.001[b]

[a]See Table 2 for variable descriptions.
[b]p-value is one tailed because a difference was hypothesized between the accept and reject group. Unless indicated otherwise, all other p-values are two tailed.

(p-value < 0.001, one tailed). The mean difference of 1.17 between the reject group and the control group is also significantly different (p-value < 0.001, two tailed) while the mean difference of 0.08 between the accept group and the control group is not significantly different (p-value $= 0.600$, two tailed).[8]

These results support our hypothesis that framing tendencies are affected by participants' decision to accept or reject the investment. Specifically, when participants chose to reject the investment they negatively framed a significantly greater number of financial indicators compared to participants that chose to accept the investment. This suggests that when summarizing financial information for management, participants may consciously utilize persuasive communication by framing information in a manner consistent with their investment preference, particularly when choosing to reject the potential investment. When participants chose to accept the investment they framed the information positively. This positive framing was insignificantly higher than the control group. The insignificance is in some part due to the fact that the control group approached the maximum positive position available so that there was little room for the accept group to be significantly more positive than the control group.

Supplemental Analysis

While the participants in the control group were not asked to make a decision before the information summarization, they were asked to indicate their decision preference at the very end of the case after the summarization. We used this preference decision to examine whether participants had an undisclosed investment preference while summarizing the information. In other words, did participants' internally generate an accept or reject investment preference even though they were not required to make an investment decision prior to summarizing the information. If so, an undisclosed preference may have affected their framing of the financial indicators. To our knowledge, no previous research has investigated the possibility of an undisclosed preference and its potential impact on framing behaviors. To investigate this possibility, we performed a t-test comparing the mean frame sum scores of the two groups of control participants created by their after-the-fact accept/reject investment decision. Differences in frame sum scores between the two groups would suggest that the undisclosed preferences did affect participants' framing behavior.[9] The mean frame sum scores for control group participants that chose to accept and reject the investment were 2.75 ($n = 28$) and 2.50 ($n = 22$), respectively. Although the

mean difference of 0.25 is in the expected direction (i.e., less positive frames for participants that chose to reject the investment), it is not statistically significant ($p = 0.308$, two tailed). This result suggests that participants' framing behaviors were not affected by undisclosed investment preferences. The 2.75 mean frame sum score of control group participants that chose, post hoc, to accept the investment is not significantly different ($p = 0.862$, two tailed) than the 2.72 mean frame sum score of participants in the accept group from the main analysis. The 2.50 mean frame sum score of control group participants that chose, post hoc, to reject the investment is significantly higher ($p = 0.002$, two tailed) than the 1.47 mean frame sum score of participants in the reject group from the main analysis. Also, the 2.50 mean frame sum score of control group participants that chose, post hoc, to reject the investment is not significantly different ($p = 0.311$, two tailed) than the 2.72 mean frame sum score of participants in the accept group from the main analysis. Together, these results further suggest that participants did not internally generate an accept/reject decision when they were not required to disclose one, and therefore, an undisclosed preference did not affect the participants' framing behavior.

To understand more fully the framing strategies utilized by participants we analyzed the various types of framing sets. That is, when asked to frame three information items, participants could have framed all three items exclusively positive (frame sum = 3), exclusively negative (frame sum = 0), or some positive and some negative (frame sum = 2 or 1). Table 4 shows for

Table 4. Frame Set Frequencies.

Frame Set[a]	Accept Group[b]		Reject Group[b]		Control Group[b]	
	N	%	N	%	N	%
All positive frames	53	86.9	29	42.6	41	82.0
Mixed frames						
Two positive, one negative	2	3.3	0	0.0	3	6.0
One positive, two negative	3	4.9	13	19.1	3	6.0
All negative frames	3	4.9	26	38.2	3	6.0
Total	61	100.0	68	100.0	50	100.0

[a]Three financial information items were summarized by participants. These items were identified as either positively framed or negatively framed.
[b]Participants that chose to accept the investment, participants that chose to reject the investment, participants that were not required to make an accept/reject decision (control group).

each group of participants the count and proportion of participants utilizing each framing set. In the accept group, 53 out of 61 participants (86.9%) framed all three financial indicators positively and 55 out of 61 participants (90.2%) framed more items positively than they did negatively (i.e., framed at least two items positively). Similarly, 41 out 50 participants (82.0%) in the control group framed all three financial indicators positively and 44 out of 50 (88.0%) framed more items positively than they did negatively. In the reject group, 26 out of 68 (38.2%) framed all three financial indicators negatively and 39 out of 68 (57.4%) framed more items negatively than they did positively. Surprisingly, 42.6% of participants framed information exclusively positive which is about the same as those who framed information exclusively negative (38.2%). These findings suggest that even when participants have incentives to frame negatively many will not change their communication framing behavior.[10]

The participants in this study consisted of both MBA and MACCT students. To examine whether the results are affected by the type of participant we performed a 3×2 ANOVA with frame sum score as the dependent variable and decision preference (accept, reject, or control) and participant type (MBA or MACCT) as the independent variables. The results of the ANOVA (not presented) indicate that the decision preference main effect remains significant (F-score $= 26.251$, p-value < 0.001, one tailed) while the participant type main effect (F-score $= 1.259$, p-value $= 0.263$, two tailed) and the interaction of decision preference and participant type (F-score $= 0.427$, p-value $= 0.653$, two tailed) are not statistically significant. These results indicate the results of our main analysis are consistent across both groups of participants.

We next investigated whether the participants' gender affected the results of our analysis. To do this, we performed a 3×2 ANOVA with frame sum score as the dependent variable and decision preference (accept, reject, and control) and participant gender (male or female) as the independent variables. The results of the ANOVA (not presented) indicate that the decision preference main effect remains significant (F-score $= 27.219$, p-value < 0.001, one tailed) while the gender main effect (F-score $= 0.020$, p-value $= 0.889$, two tailed) and the interaction of decision preference and gender (F-score $= 1.234$, p-value $= 0.294$, two tailed) are not statistically significant. We also investigated whether any of the other demographic variables affected the participants' framing behavior. The other demographic variables of interest include years of business experience, graduate GPA, undergraduate hours of finance, graduate hours of finance, undergraduate hours of managerial accounting, and graduate hours of managerial

accounting. We investigated these six continuous demographic variables by performing a separate analysis of covariance (ANCOVA) for each of the demographic variables. For each ANCOVA, a different demographic variable was used as the covariate, frame sum score was the dependent variable, and decision preference (accept, reject, control) was the independent variable. Decision preference remained significant (F-scores ranged from 21.692 to 27.006 and one-tailed p-values were all < 0.001) in each of the ANCOVAs while none of the six demographic variables were statistically related to frame sum (F-scores ranged from 0.002 to 2.179 and two-tailed p-values ranged from 0.965 to 0.142). Taken together, these tests indicate that the results of our main analysis are not affected by the demographic variables nor were the framing behaviors of participants affected by the demographic variables.

CONCLUSION

Understanding how accountants prepare information to be communicated to another party is very important because prior research has consistently shown that decisions are affected by the way information is presented/framed (e.g., Rutledge, 1995; Emby, 1994; Emby & Finley, 1997; Hasseldine & Hite, 2003). This is especially important for managerial accounting, as management accountants are responsible for identifying, interpreting, and communicating information within the organization (Institute of Management Accountants, 1981). This study analyzes the use of persuasive communications by masters-level business students when considering a capital investment decision. Specifically, we investigate individuals' framing behavior when presenting information to management. Findings suggest that, as hypothesized, individuals' investment decisions play an important role in how information is framed. Specifically we found that reject decisions resulted in more negative communication frames than accept decisions. This suggests that individuals may intentionally frame information consistent with their investment preference (accept or reject). While reject decisions were clearly different than both accept decisions and a no decision control group, those choosing to accept an investment did not use significantly more positive frames than the no decision control group. Considering the tendency to frame information positively rather than negatively (Wang, 2004; van Schie & van der Pligt, 1990; Elliott & Archibald, 1989), this finding suggests that when individuals feel an investment should be accepted they frame information in a manner

consistent with the general tendency toward positive communication frames. Supplemental analysis found no evidence of an undisclosed investment preference impacting communication behavior, suggesting persuasive communication framing may not occur if an investment preference opinion is not initially requested from the information preparer.

This study contributes to the accounting literature in many ways, and our results also have implications for management accounting practitioners. This is the first study to investigate the use of persuasive communications in the capital budgeting process, and it is also the first to analyze communication framing behaviors in a specifically managerial accounting context. This is an important endeavor considering the role of the management accountant as the "interpreter and communicator" of organizational information. Our results suggest that individuals required to present an investment decision to management may utilize persuasive communication frames when providing investment-related information. Individuals likely frame information consistent with their decision in order to induce management's agreement with their decision. For management accounting practitioners, our results suggest that an individual should be careful when seeking a summary of accounting information for a potential investment. If a preference between options is requested, decision makers should be aware that persuasive communication frames are likely to be employed, especially if the communicator's opinion is to reject. Our supplemental analysis suggests that the difference in the use of communication frames is not likely to occur if no request is made for the communicator's preference. Based on these findings, we suggest that managers should request supporting information relating to potential projects without the communicator's accept or reject decision. If managers do want the communicator's decision, managers should first review the supporting information and form their own opinion prior to requesting the communicator's decision. Finally, managerial accounting decision makers should be aware that information is generally communicated in a positive manner. To reduce the likelihood of biased project information, we recommend accounting communicators be trained to provide objective and neutral financial information for potential projects. Project information forms that request data in a standardized format may also reduce the threat of biased project data.

The study also considers two factors in communication framing that have been neglected in the past research. First, we consider a no-decision control group, and find interesting similarities between the control group and the positive incentive (accept investment) group. Second, we consider the

possibility of biased communication when no specific decision preference was requested. Preference can certainly be generated automatically (Russo, Medvec, & Meloy, 1996) without having to be disclosed, but this possibility has been given no consideration in the accounting communication studies.

The results of the current study open several avenues for additional research. While this study investigated the use of communication frames, future accounting research should investigate what other types of persuasive communication individuals may use to stylize information or to induce management/reviewer agreement. Research designs created to illicit ample and rich qualitative data may prove fruitful in exploring other persuasive tactics. Future accounting research should also continue to investigate not only how framed accounting information affects decisions, but also how accountants choose to frame accounting information and what factors influence their choice of frames. For example, Shankar and Tan (2006) show that communications vary in the auditing domain based on several characteristics related to the decision. Future research should consider how these additional characteristics impact how communicated information is framed. In addition, the relationship between decision preference and no decision raises several important questions for accounting researchers when analyzing the impact of framing. How does the tendency to communicate via positive frames impact decision makers when considering information framed positively? It may be that accountants and auditors are conditioned over time to correct for positive frame biases because of the regularity of their occurrence. The tendency to frame information positively could also suggest that professionals are more likely to infer signaling behaviors when they are presented negative frames. Future research should continue to consider how communication frames are analyzed and used in accounting decisions.

Like all research, this study has limitations. The research case used in the current study is limited with regards to the information provided and the setting. While this limits the external validity of the study it is necessary to strengthen the study's internal validity. Also, the current study uses masters-level business students as participants. Although the students had an average of over 4 years of business experience, the communication of professionals that deal with this type of information on a daily basis could be different. Finally, the presentation of the case may have provided some predecision frame. In all versions, our case presented the number of Monte Carlo simulations above the specified goal before the number of simulations below the goal. As discussed previously, we deemed this limitation necessary to provide a normal, more realistic case and we believe this order should

only serve to bias us against finding results because it reduces the likelihood of participants utilizing negative frames.

The current study investigated the use of persuasive communications in accounting. Specifically, we analyzed the impact of investment preference on the use of persuasive communication frames. Consistent with expectations, investment preference did impact the use of persuasive communication frames as the use of negative frames were more common when an investment was rejected than when an investment was accepted or when no investment preference was requested. These findings are important because accounting research has consistently shown that decisions are influenced by how information is framed. Considering the pivotal role capital budgeting decisions play in an organization's long-term success (Clancy et al., 1982), future research should continue investigating the behavioral aspects of this decision process.

NOTES

1. These results have also been shown to be largely unaffected by the relative likelihood of the outcomes of interest. For instance, in a gambling context Levin et al. (1986) consider the probability of *winning* a gamble at varying degrees of likelihood and show that unless extremely high or low ($<10\%$ or $>90\%$ chance of winning), the frame of *winning* versus *losing* still results in decision differences.

2. The current study is distinct from Shankar and Tan (2006) who provide the auditor with the opinions of both the client and the reviewer. This is likely to put the auditor in a conflicting or supporting relationship with one or both parties. Our study assumes no such position with another party, and therefore, analyzes a different motivation for persuasive communication.

3. The capital budgeting scenario in this case most resembles a single option investment decision (accept/reject), rather than a choice between multiple options. While capital budgeting decisions vary considerably in practice, a common thread is the presence of a decision (e.g., accept or reject a single project, accept one of five potential projects, etc.). Whenever individuals make a decision they develop an emotional investment in the ultimate outcome and will therefore seek to defend their preference to others. We believe individuals' need to justify their decision will generalize across any capital budgeting scenario that requires a decision or recommendation.

4. A total of 228 research cases were collected; however, 49 of these cases were excluded. Thirty-three participants failed to complete the dependent and/or independent variables, 14 were not MBA or MACCT students, and two individuals suggested that they had completed a similar case in the past.

5. The responses to the information summarization task varied. However, the vast majority were labeled as success simulations or failure simulations. Any responses that were blank or noninterpretable (e.g., participant's framing of the information

could not be identified as either positive/success or negative/failure) were excluded from consideration. Of the 179 participants, 167 (93.30%) presented accurate simulation percentages to management (e.g., 49% of NPV simulations were successful or 51% of NPV simulations were failure).

6. The high percentage of participants framing the information exclusively positive may be influenced by the presentation of simulation successes before simulation failures.

7. We believe requiring participants to make an investment decision prior to summarizing the financial information for management creates a feeling of need to support/justify their decision. Lending support to this, 54.3% of participants that were required to first make an investment decision provided additional written comments for management (52.5% for those that accepted the investment and 55.9% for those that rejected the investment) while only 42.0% of the control group participants provided additional comments.

8. Some participants indicated in their additional written comments for management that they believe the net present value indicator was the most important indicator of project success or failure. So we performed our primary analysis using two alternative dependent variables instead of the frame sum score: NPV as the only indicator, and; cue sum score with NPV given a weight of two and accounting rate of return and payback period given a weight of one. Results of the analysis using these two dependent variables are qualitatively the same (not presented) as the results presented in our primary analysis.

9. This follows the same logic of our main analysis, but in the opposite direction. The main analysis found that different investment preferences led to different framing behaviors (i.e., changes in "A" led to changes in "B"). For the current analysis, we are investigating whether there were different framing behaviors (i.e., changes in "B") and if there were, we are theorizing the most likely cause would have been the different undisclosed investment preferences (changes in "B" were most likely caused by changes in "A").

10. This study was not designed to ensure all participants provided written comments. This can be seen in that less than 50% of the participants provided written comments. Although any detailed analysis of the written comments could not be generalized to the entire sample, two of the researchers did independently review the participants' additional written comments for management and neither was able to identify any underlying strategies or patterns (e.g., participants in the reject group could have chosen to reiterate the "strongest" indicator of project failure). Future research may seek to design cases that illicit more qualitative data that can be analyzed with qualitative software packages.

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APPENDIX A

*Research Case Requiring Participants to Make An Accept Reject
Investment Decision Prior to Summarizing the Financial Information
(Accept and Reject Groups)*

Your participation in this research is entirely voluntary. You may
refuse to participate or you may stop participating at any time without
penalty or loss of benefits.

We are interested in your opinion on a capital budgeting task.
Please consider the information contained in this packet and answer
all questions. This research is aimed at developing a greater
understanding of the capital budgeting decision process. As you
continue through the case, feel free to refer back to previous material.
After you complete all questions, please return this booklet to the
individual who gave it to you.

Please know that all of your responses are strictly confidential
and any future reports based on this study will disclose only
aggregated results.

Thank you for your participation in this study.

Please turn the page and follow the instructions provided
in the booklet.

GENERAL INFORMATION

HER Apparel, Inc. is a manufacturer and distributor of women's clothing.
HER has historically focused on professional and casual clothing styles for
women between the ages of 25 and 45. In 2004, HER recorded $10 million
sales, with 2004 profits of $1.2 million and total assets of $14 million. While
HER has generally had steady growth in terms of both sales and profits, the
board of directors and management have noted that HER's major clothing
lines are approaching product cycle maturity. Therefore, the company has
been in the process of considering new product lines and new target markets.
While many possibilities have been considered, the company is currently
giving serious consideration to a new clothing line for young women
between the ages of 15 and 25. All levels of management have been involved
in considering the possibilities for the potential line, and extensive market

research has been performed. Based on the collective knowledge obtained via these diverse sources, financial estimates for the new product line have been developed.

Several years ago the management of HER Apparel realized that they were not giving appropriate consideration to information risk when making new product decisions. Specifically, these decisions were based on popular financial indicators (Net Present Value, etc.) that required several subjective estimates, but no consideration was given to the possibility of inaccurate estimates or the impact these inaccuracies could have on the financial indicators. To remedy this problem, HER developed a Monte Carlo simulation program. Monte Carlo techniques quantify the impact of discrepancies in the timing of cash flows, the amount of competition, unexpected production difficulties, and many other contingencies on financial indicators, such as Net Present Value. The program provides this information by calculating the desired financial indicator thousands of times, making different assumptions about the amount and timing of cash flows in each calculation. The range of assumptions used by the computer program is generally based on the expected cash flows provided through market research and the likely frequency distribution of these cash flows. With this information, the decision maker cannot only consider the expected value of a financial indicator, but also its variation.

The Monte Carlo program provides the decision maker three important information items relating to each financial indicator. One information item provided by the program is the *target or goal* for each financial indicator. For instance, if calculating the Net Present Value for the new clothing line, the program output would first provide the company goal of $0. In addition, the output provides the number of *simulation successes* and *simulation failures*. Considering the Net Present Value example above, the program would provide the number of simulations that achieved the $0 goal as simulation successes and the number of simulations that did not achieve the $0 goal as simulation failures. To provide additional insight regarding information risk, a graphical display of all simulations is provided. The graphical display has the company target as the midpoint, and observations to the right of the midpoint are simulation successes while those to the left of the midpoint are simulation failures. An example of the graphical display is given at the bottom of this page. Finally, the output provides the *expected value* for each financial indicator. This expected value is calculated by taking the average of all simulation outcomes.

Example: Graphic Display

PROFESSIONAL ROLE AND TASK

The Controller's Office plays a key role in product expansion decisions at HER Apparel. The office is responsible for summarizing the information included in the Monte Carlo simulation output for management consideration. To minimize confusion about the Monte Carlo procedures, the Controller's Office only includes information that is absolutely necessary for managerial decisions. Please assume the role of a Staff Accountant at the Controller's Office. As a Staff Accountant you are responsible for summarizing the essential information provided by the Monte Carlo simulation procedure and providing an initial recommendation to management of whether the company should accept or reject the current investment opportunity. The financial indicators deemed relevant for the current decision and their justification are provided below.

Net Present Value: The present value of cash inflows and outflows for the life of the project. Cash flows are discounted to present value based on the company's required rate of return and the company goal is $0. This measure is generally believed to be the most effective measure of overall investment value, and it is the only measure included that controls for the time value of money.

Payback Period: The number of periods/years before the cash inflows from the investment will equal the amount of the initial cash outflow. These cash flows are not discounted to present value. The company goal is 3.5 years.

This measure is important for two reasons. First, it provides information relevant to future investment decisions; the sooner the company gets back the invested capital, the sooner the company can invest in additional projects. Second, conventional wisdom suggests that as cash inflows extend further into the future, they become more speculative (i.e., less certain).

Accounting Rate of Return: The average annual income of the project divided by the initial investment. This calculation employs revenue and expenses, rather than cash inflows and outflows. The company goal is the required rate of return of 17%. This measure is also a holistic assessment of investment value (like NPV), but the focus is on revenues and expenses rather than cash inflows and outflows. Performance assessments and manager bonuses are generally based on accounting measures (i.e., revenue and expense), and these measures can vary substantially from cash inflows and outflows.

MONTE CARLO SIMULATION OUTPUT

Net Present Value:

Stated Goal:	$ 0.00
Expected Value:	$ 2.50
Simulation Success:	4,900 simulations
Simulation Failure:	5,100 simulations
Simulation Total:	10,000 simulations

Net Present Value: Monte Carlo Graphical Display

Payback Period:

Stated Goal:	3.5000 years
Expected Value:	3.6025 years
Simulation Success:	4,800 simulations
Simulation Failure:	5,200 simulations
Simulation Total:	10,000 simulations

Payback Period: Monte Carlo Graphical Display

Accounting Rate of Return:

Stated Goal:	17%
Expected Value:	17.225%
Simulation Success:	5,300 simulations
Simulation Failure:	4,700 simulations
Simulation Total:	10,000 simulations

Accounting Rate of Return: Monte Carlo Graphical Display

PROPOSAL RECOMMENDATION AND INFORMATION SUMMARIZATION FOR MANAGEMENT CONSIDERATION

This page is designed to provide management with all relevant information concerning the proposed investment. Management is primarily interested in three things: (1) your recommendation concerning the investment project, (2) the overall average for each indicator across all Monte Carlo simulations (i.e., expected value), and (3) the relationship, in terms of percentages between Monte Carlo simulation outcomes and the company goal for each indicator (i.e., investment variation).

Recommendation for Management: Based on your understanding and consideration of the three financial indicators, would you recommend that management accept or reject the current investment opportunity (please circle your choice below)?

ACCEPT   REJECT

Information Summarization for Management: After making your recommendation, please summarize the three financial indicators you considered by completing all statements below:

Net Present Value (NPV):

1. Based on the Monte Carlo procedure, _____% of the NPV simulations were _____.
2. The expected value for NPV on the current proposal was $_____.

Payback Period (PBP):

1. Based on the Monte Carlo procedure, _____% of the PBP simulations were _____.
2. The expected value for PBP on the current proposal was _____.

Accounting Rate of Return (ARR):

1. Based on the Monte Carlo procedure, _____% of the ARR simulations were _____.
2. The expected value for ARR on the current proposal was _____.

ADDITIONAL COMMENTS FOR MANAGEMENT

Management would like to consider any additional comments you have regarding your recommendation relating to the current investment opportunity. Please provide additional comments, if any, below.

_____

_____

_____

_____

_____

_____

_____

_____

GENERAL QUESTIONS

1. What is your program of study?
   _____Graduate – Master of Business Administration
   _____Graduate – Master of Accountancy
   _____Other: ___*Graduate* ___*Undergraduate*
   Major/Concentration: _____
2. What is your graduate overall grade point average?_____
3. What was your undergraduate major?_____
4. a. How many undergraduate credit hours of managerial/cost accounting courses have you had?_____
4. b. Including this semester, how many graduate credit hours of managerial/cost accounting courses have you had?_____
5. a. How many undergraduate credit hours of finance courses have you had?_____
5. b. Including this semester, how many graduate credit hours of finance courses have you had?_____

6. How many years of business experience have you had?_____
7. How would you describe your current or most recent business position (e.g., marketing product manager, audit manager, senior financial analyst, etc.)?_____
8. What is your gender?
    _____Male
    _____Female

Thanks again for your participation!

APPENDIX B

Research Case Not Requiring Participants to Make An Accept Reject Investment Decision Prior to Summarizing the Financial Information (Control Group)

Your participation in this research is entirely voluntary. You may refuse to participate or you may stop participating at any time without penalty or loss of benefits.

We are interested in your opinion on a capital budgeting task. Please consider the information contained in this packet and answer all questions. This research is aimed at developing a greater understanding of the capital budgeting decision process. As you continue through the case, feel free to refer back to previous material. After you complete all questions, please return this booklet to the individual who gave it to you.

Please know that all of your responses are strictly confidential and any future reports based on this study will disclose only aggregated results.

Thank you for your participation in this study.

Please turn the page and follow the instructions provided in the booklet.

GENERAL INFORMATION

HER Apparel, Inc. is a manufacturer and distributor of women's clothing. HER has historically focused on professional and casual clothing styles for women between the ages of 25 and 45. In 2004, HER recorded $10 million sales, with 2004 profits of $1.2 million and total assets of $14 million. While HER has generally had steady growth in terms of both sales and profits, the board of directors and management have noted that HER's major clothing lines are approaching product cycle maturity. Therefore, the company has been in the process of considering new product lines and new target markets. While many possibilities have been considered, the company is currently giving serious consideration to a new clothing line for young women between the ages of 15 and 25. All levels of management have been involved in considering the possibilities for the potential line, and extensive market research has been performed. Based on the collective knowledge obtained via these diverse sources, financial estimates for the new product line have been developed.

Several years ago the management of HER Apparel realized that they were not giving appropriate consideration to information risk when making new product decisions. Specifically, these decisions were based on popular financial indicators (Net Present Value, etc.) that required several subjective estimates, but no consideration was given to the possibility of inaccurate estimates or the impact these inaccuracies could have on the financial indicators. To remedy this problem, HER developed a Monte Carlo simulation program. Monte Carlo techniques quantify the impact of discrepancies in the timing of cash flows, the amount of competition, unexpected production difficulties, and many other contingencies on financial indicators, such as Net Present Value. The program provides this information by calculating the desired financial indicator thousands of times, making different assumptions about the amount and timing of cash flows in each calculation. The range of assumptions used by the computer program is generally based on the expected cash flows provided through market research and the likely frequency distribution of these cash flows. With this information, the decision maker cannot only consider the expected value of a financial indicator, but also its variation.

The Monte Carlo program provides the decision maker three important information items relating to each financial indicator. One information item provided by the program is the *target or goal* for each financial indicator. For instance, if calculating the Net Present Value for the new clothing line,

the program output would first provide the company goal of $0. In addition, the output provides the number of *simulation successes* and *simulation failures*. Considering the Net Present Value example above, the program would provide the number of simulations that achieved the $0 goal as simulation successes and the number of simulations that did not achieve the $0 goal as simulation failures. To provide additional insight regarding information risk, a graphical display of all simulations is provided. The graphical display has the company target as the midpoint, and observations to the right of the midpoint are simulation successes while those to the left of the midpoint are simulation failures. An example of the graphical display is given at the bottom of this page. Finally, the output provides the *expected value* for each financial indicator. This expected value is calculated by taking the average of all simulation outcomes.

Example: Graphic Display

PROFESSIONAL ROLE AND TASK

The Controller's Office plays a key role in product expansion decisions at HER Apparel. The office is responsible for summarizing the information included in the Monte Carlo simulation output for management considera- tion. To minimize confusion about the Monte Carlo procedures, the Controller's Office only includes information that is absolutely necessary for

managerial decisions. Please assume the role of a Staff Accountant at the Controller's Office. As a Staff Accountant you are responsible for summarizing for management the essential information provided by the Monte Carlo simulation procedure. The financial indicators deemed relevant for the current decision and their justification are provided below.

Net Present Value: The present value of cash inflows and outflows for the life of the project. Cash flows are discounted to present value based on the company's required rate of return and the company goal is $0. This measure is generally believed to be the most effective measure of overall investment value, and it is the only measure included that controls for the time value of money.

Payback Period: The number of periods/years before the cash inflows from the investment will equal the amount of the initial cash outflow. These cash flows are not discounted to present value. The company goal is 3.5 years. This measure is important for two reasons. First, it provides information relevant to future investment decisions; the sooner the company gets back the invested capital, the sooner the company can invest in additional projects. Second, conventional wisdom suggests that as cash inflows extend further into the future, they become more speculative (i.e., less certain).

Accounting Rate of Return: The average annual income of the project divided by the initial investment. This calculation employs revenue and expenses, rather than cash inflows and outflows. The company goal is the required rate of return of 17%. This measure is also a holistic assessment of investment value (like NPV), but the focus is on revenues and expenses rather than cash inflows and outflows. Performance assessments and manager bonuses are generally based on accounting measures (i.e., revenue and expense), and these measures can vary substantially from cash inflows and outflows.

MONTE CARLO SIMULATION OUTPUT

Net Present Value:

Stated Goal:	$ 0.00
Expected Value:	$ 2.50
Simulation Success:	4,900 simulations
Simulation Failure:	5,100 simulations
Simulation Total:	10,000 simulations

Net Present Value: Monte Carlo Graphical Display

Payback Period:

Stated Goal:	3.5000 years
Expected Value:	3.6025 years
Simulation Success:	4,800 simulations
Simulation Failure:	5,200 simulations
Simulation Total:	10,000 simulations

Payback Period: Monte Carlo Graphical Display

Accounting Rate of Return:

Stated Goal:	17%
Expected Value:	17.225%
Simulation Success:	5,300 simulations
Simulation Failure:	4,700 simulations
Simulation Total:	10,000 simulations

Accounting Rate of Return: Monte Carlo Graphical Display

Accounting Rate of Return Outcome Categories

INFORMATION SUMMARIZATION FOR MANAGEMENT CONSIDERATION

This page is designed to provide management with all relevant information concerning the proposed investment. Management is primarily interested in two things: (1) the overall average for each indicator across all Monte Carlo simulations (i.e., expected value) and (2) the relationship, in terms of percentages between Monte Carlo simulation outcomes and the company goal for each indicator (i.e., investment variation).

Information Summarization for Management: Please summarize the three financial indicators you considered by completing all statements below:

Net Present Value (NPV):

3. Based on the Monte Carlo procedure, _____% of the NPV simulations were _____.
4. The expected value for NPV on the current proposal was $_____.

Payback Period (PBP):

3. Based on the Monte Carlo procedure, _____% of the PBP simulations were _____.
4. The expected value for PBP on the current proposal was _____.

Accounting Rate of Return (ARR):

3. Based on the Monte Carlo procedure, _____% of the ARR simulations were _____.
4. The expected value for ARR on the current proposal was _____.

ADDITIONAL COMMENTS FOR MANAGEMENT

Management would like to consider any additional comments you have regarding the current investment opportunity. Please provide additional comments, if any, below.

_____

_____

_____

_____

_____

_____

_____

_____

_____

GENERAL QUESTIONS

1. What is your program of study?
    _____Graduate – Master of Business Administration
    _____Graduate – Master of Accountancy
    _____Other:___ *Graduate*___ *Undergraduate*
    Major/Concentration: _____
2. What is your graduate overall grade point average?_____
3. What was your undergraduate major? _____
4. a. How many undergraduate credit hours of managerial/cost accounting courses have you had? _____
4. b. Including this semester, how many graduate credit hours of managerial/cost accounting courses have you had? _____
5. a. How many undergraduate credit hours of finance courses have you had? _____
5. b. Including this semester, how many graduate credit hours of finance courses have you had? _____

6. How many years of business experience have you had? _____
7. How would you describe your current or most recent business position (e.g., marketing product manager, audit manager, senior financial analyst, etc.)? _____
8. What is your gender?
   _____Male
   _____Female

SUPPLEMENTAL INVESTMENT PREFERENCE

For the following question, feel free to refer to the three financial indicators presented on pages 5 and 6 (pages 144 to 146 in this paper); however please *do not* change any of your previous responses.

Based on your understanding and consideration of the three financial indicators presented in this study, if the investment decision was yours to make, would you accept or reject the investment (please circle your choice below)?

ACCEPT   REJECT

Thanks again for your participation!

FACILITATING A TEAM
CULTURE: A COLLABORATIVE
BALANCED SCORECARD AS AN
OPEN REPORTING SYSTEM

Hemantha S. B. Herath, Wayne G. Bremser and Jacob G. Birnberg

ABSTRACT

The balanced scorecard (BSC) allows firms to place importance on both financial and nonfinancial performance measures in four perspectives for developing and implementing corporate strategy and performance evaluation. The BSC literature however provides minimal insight on how to set targets, how to weigh measures when evaluating managers and the firm, and how to resolve conflicts that arise in the BSC process. Researchers have attempted to fill these gaps using two contending approaches. In particular, Datar et al. (2001) uses an agency model to select the optimal set of weights and more recently Herath et al. (2009) develop a mathematical programming–based collaborative decision model to find the optimal (or approximately optimal) set of target and weights considering inputs from two parties. In this article, we apply the Herath et al. (2009) model to a detailed BSC example. We demonstrate how the collaborative BSC model can be implemented in Microsoft Excel by practitioners to minimize BSC conflicts. Finally, we discuss

*how the model facilitates alignment and a culture of open reporting
(information sharing) around the BSC that is necessary for its effective
implementation.*

INTRODUCTION

Organizations use performance targets to implement strategy. In many
organizations, targets are used to communicate to participants a firm's
strategy in some way that allows for accountability. In traditional
organizations that rely on financial control systems, budget targets are the
primary emphasis. Since the development of the balanced scorecard (BSC)
in the 1990s, many organizations use BSCs, which provides a framework for
selecting multiple strategic goals and financial and nonfinancial performance
measures for the customer, internal process, and learning and growth
perspectives. Kaplan and Norton (1992, 1996a, 1996b, 2006) advocate that
the BSC be used for aligning, communicating and linking the company's
strategic goals, and for evaluating performance.

The BSC literature however is largely silent on two issues critical to
those interested in applying the BSC: How to set targets, how to weigh
(or balance) measures when evaluating managers and the firm, and how
to resolve conflicts that arise in the BSC process (Datar, Kulp, & Lambert,
2001; Herath, Bremser, & Birnberg, 2009; Wong-On-Wing, Guo, Li, &
Yang, 2007).

When a firm wants to link compensation to BSC performance, manage-
ment has to set targets and determine the relative importance assigned to
each perspective and the component objectives. This is done by using
weights that reflect the relative importance of each perspective and the
performance measures for each objective. However, as noted above the
literature is essentially silent on these issues. Thus, although targets are
used in practice, and business intelligence software is used to compare
performance with targets, there is limited research on target setting (Ittner &
Larcker, 2001). Furthermore, Ittner and Larcker (2003) report the reality is
that only a few companies realize the potential benefits of using nonfinancial
measures; and they identify a common mistake as ''not setting the right
performance targets.'' The scorecard effectiveness relies heavily on the both
the targets and weighting of measures. Managers' views about attainability
of targets, their viability, and likelihood of success are considerations in
setting BSC targets and weights. Including the managers and employees

being evaluated in the target-setting process has advantages. Both managers and employees have information about internal processes and customers relevant to setting targets. Employee inclusion in the target-setting process increases buy-in and support for the BSC as a management tool.

Several researches have attempted to fill these above-mentioned gaps in the BSC literature using two contending approaches. In particular, Datar et al. (2001) uses an agency model to select the optimal set of weights. Wong-On-Wing et al. (2007) find that common measure bias and a tendency to overlook the causal linkages between driver and outcome measures leads to disagreement (conflict) between top management and divisional managers hindering the implementation of a BSC. More recently, Herath et al. (2009) develop a collaborative decision model to find the optimal (or approximately optimal) set of targets and weights considering inputs from two parties reducing the likelihood of BSC conflicts.

In this paper, we show how to apply the Herath et al. (2009) model using a detailed example to demonstrate how the joint decision model for selecting targets and weights can be implemented using Microsoft Excel software. (The hands on modeling and solution of the BSC model are valuable to practitioners who want to use the model to minimize BSC conflicts that arise in the BSC process. Also, we believe that the model can be used for innovation in teaching the BSC. We further discuss how the model facilitates alignment and a culture of open reporting (information sharing) that is necessary for an effective BSC strategy (Kaplan & Norton, 2001, 2006). Reducing BSC conflicts is important for a successful BSC implementation and thus we provide a valuable contribution to both pedagogy and practice. The paper is organized as follows. The next section provides a literature review. Detailed case illustration provides an application to illustrate how the model can be used to jointly determine BSC targets and weights. The section Conclusions discusses results and future research extensions.

LITERATURE REVIEW

In the design and implementation of a BSC, an important issue raised in the literature is the bias toward common (nonlinked financial) measures (Lipe & Salterio, 2000; Banker, Chang, & Pizzini, 2004). Although, approaches to minimize common measure bias have been suggested (Libby, Salterio, & Webb, 2004), Wong-On-Wing et al. (2007) find that these biases result in disagreement (conflict) between top management and divisional managers. Studies have reported on firms' use of performance targets in the context of

incentive compensation (e.g., Indjejikian & Nanda, 2002; Murphy, 2001). Ittner, Larcker, and Meyer (2003) report on subjectivity and weighting of performance measures. In the firm studied, managers complained about favoritism in the bonus system because the weighting of nonfinancial measures was not viewed as being fair; and the firm subsequently discontinued using the BSC system for bonuses.

Another practical BSC issue is management's inclination to use stretch targets to improve performance. Stretch targets can be used to drive organizational change, and the change emphasis is expressed through performance evaluation. The problem with stretch targets is that often they are a result of a fragmented approach that attempts to establish ambitious targets for isolated measures without adequately providing employees with the knowledge, tools, and means to achieve these ambitious targets (Kaplan & Norton, 1996b). Based on a field study, Ittner and Larcker (2003) reported that outstanding nonfinancial performance is not always beneficial and often produces diminishing or even negative economic returns. Ittner and Larcker (2003, p. 92) state, "Target setting is inherently difficult because it always takes awhile for improvements in a driver of corporate performance to produce improvements in the performance it's meant to affect. Sometimes, efforts to improve nonfinancial measures can even damage short-term returns." They suggest that firms set lower interim financial goals when nonfinancial performance improvements are expected to eventually pay off.

Active participation in the BSC process by all stakeholders has been suggested in the recent literature (Kaplan & Norton, 2001, 2006). Learning and feedback has been touted as an important component in the success of a BSC strategy. Kaplan and Norton (2001) argue that instead of a single feedback loop (reporting and control), strategy-focused firms use a double-loop feedback that promotes a culture of teamwork and problem-solving around the strategy. In the double-loop control, there is continuous learning that allows examining the strategy, examining the assumptions underlying the strategy, and revising the targets and the weights. The double-loop control that frames a problem-solving approach encourages risk taking and innovation.

Kaplan and Norton (2001) suggest that the BSC should be used as an open reporting system. Open reporting system makes information available to all. Although, often individuals tend to hold information confidential to retain advantage, they argue that companies should attempt to break through such constraints. Rowe (2004) reports that when group members are shown the effects of group actions through the accounting system they

will behave in a more cooperative manner. More specifically, there is evidence that members reveal their private knowledge differently depending on whether the organization's process-change strategy is either continuous (e.g., total quality management) or discontinuous (e.g., process reengineering). Rowe, Birnberg, and Shields (2008) illustrate this phenomenon in a field study and find that if the organizational process strategy is discontinuous, members reveal private knowledge to collaborate and identify integrative benefits to the organization.

A collaborative decision model was developed by Herath et al. (2009) to determine BSC targets and weights when preferences of two parties are considered (CEO, subunit manager – SBU). This model finds an optimal (or approximately optimal) set of targets and weights that are expected to increase the joint value to two parties with diverse preferences (signals). Their study also addresses reliability and credibility issue of unique performance measures as discussed above by considering individual preferences jointly in determining the BSC weights. The approach adopted by Herath et al. (2009) is a participative collaborative BSC approach, which promotes information sharing and may help facilitate organizational cultural change. Furthermore, joint decision-making approach reduces BSC conflicts highlighted by Wong-On-Wing et al. (2007), a constraint to the successful BSC implementation. In their most recent book, Kaplan and Norton (2006) emphasize the importance of aligning decentralized units, individual goals, management processes and systems to create a new source of value termed "enterprise-derived" value which is the value at the enterprise level and not at the business unit level that further lend support for the joint BSC model.

DETAILED CASE ILLUSTRATION

In this section, we illustrate an application of the Herath et al. (2009) model (referred to as the collaborative BSC target and weight selection model or BSCTW) to determine optimal (or approximately optimal) performance targets and weights when there are two parties. The joint decision model is a set of mathematical programming models each with an objective function and a set of constraints. We use a detailed example of Carter, Inc. to illustrate how the model can be implemented in Microsoft Excel using the Solver Program. We adopt the Microsoft Excel grid format with columns denoted by an alphabetical letter (A, B, …) and rows denoted by a number (1, 2, …) for explanation purposes. Readers interested in the mathematical formulation are referred to the original model in Herath et al. (2009).

Carter, Inc. has a product innovation/customer intimacy customer value proposition. We assume that the CEO and SBU manager have agreed to setting targets and weights (selecting a contract) based on analytical methods. Due to uncertainty and resource constraints we assume there is no consensus on what should be the appropriate target levels and the weighting of each measure although both the CEO and SBU manager believe that the customer value proposition is essential to the firm's continued success. They agree that there is significant value in working together to implement the strategy. In the BSCTW model, the first step is the traditional BSC procedure of hypothesizing the strategic cause–effect linkages.

The product innovation/customer intimacy value strategy cause–effect linkages are as follows. If the strategy system integration is implemented, it will then improve technology reliability and strategic climate at Carter, Inc. If these improve, then product innovation processes and outcomes will improve. If the stage gate time is reduced (product innovation process time), then product efficiency innovation will improve. If costs are reduced due to product efficiency then customer satisfaction and customer intimacy will increase resulting in more customers as well as reduction in unit costs. If customers increase then revenues will increase. The increase in revenues and reduction of unit cost will increase profits. The strategy map outlining the hypothesized cause–effect linkages are shown in Fig. 1.

We point out here that due to uncertainty and resource constraints there can be several feasible strategy implementation scenarios resulting in range of target values for each performance measure that do not disrupt the hypothesized cause–effect linkages. Thus, Table 1 presents a BSC template for Carter, Inc. with 11 goals and 13 measures, which both parties have jointly developed.[1] The multiple target levels (see Table 1, column [A], rows 1–34) for each measure (rather than one target level needed in a BSC) presented in the example suggest that there is no consensus on what should be the single specific target level for each measure. However, there is agreement that these are possible target levels given the assumed hypothetical linkages. The objective of the model is to consider individual preferences of both the CEO and the SBU manager to find the joint optimal solution, which both parties can potentially agree upon.

We show two or three possible levels that the CEO and a SBU manager could negotiate as the targets for each objective in the strategy implementation depending on the resource (financial and physical) constraints. Also, we assume that there is vertical information asymmetry, resulting from task uncertainty due to complex nature of the product and complexity of the proposed system integration and thus the input from the SBU
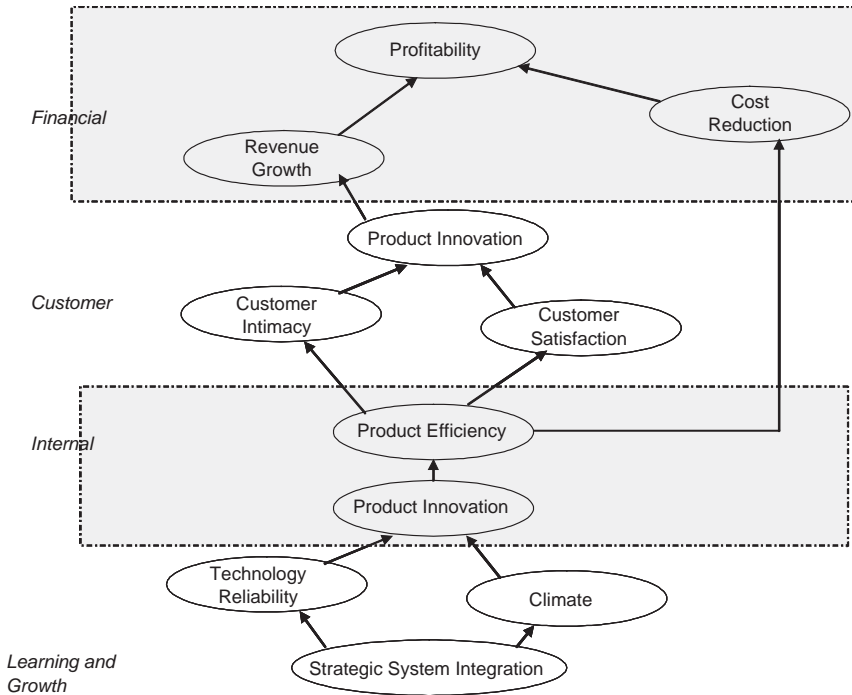
Fig. 1. Hypothesized Cause–Effect Linkage.

manager is important. Carter's two parties A (SBU manager) and B (CEO) are thus in a vertical participative setting. We assume that both parties feel that they can gain much by collaborating to implement the strategy. Thus, they have mutually agreed to commit to full open truthful exchange (FOTE) of information and collaboration to minimize their disagreements with respect to targets and weights.

In Table 2, we provide the BSC template that has been individually scored privately by each of the two parties to indicate their preferences by assigning weights. The assignment of weights is similar to a teacher assigning marks for questions in an exam. The main questions are assigned marks totaling to 100 and partial marks are assigned to the subproblems. For each issue, the parties rank ordered their preferences for the different issues (between-issue qualitative analysis) by allocating 100 points to the targets, shown in bold numbers in the payoff columns (Table 2, columns [B] and [C], rows 1–34). The remaining numbers in each target are scores given to indicate the strength of preference for the alternative target levels for each measure.

Table 1.   Balanced Scorecard Measures and Targets.

BSC		Measurement		Target
Perspective	Goals			[A]
Financial	Profitability	Earnings per share (F1)	1	30%CAGR
			2	25%CAGR
			3	20%CAGR
	Sales growth	Sales (F2)	4	25%CAGR
			5	20%CAGR
			6	15%CAGR
	Reduce cost per unit	Cost reduction (F3)	7	5%CAGR
			8	3%CAGR
Customer	Customer intimacy	Expert ranking (C4.1)	9	# 1 in Year 2
			10	# 2 in Year 2
	Customer satisfaction	Customer ranking (C4.2)	11	# 1 in Year 2
			12	# 2 in Year 2
		No. of repeat customers (C5)	13	50%
			14	60%
			15	70%
	Expand customer base	% increase-customers (C6)	16	Increase 12% annual
			17	Increase 8% annual
Internal	Product innovation	Average stage gate time (I7)	18	20 months
			19	25 months
	Product efficiency		20	30 months
			21	35 months
		Cost reduction success rate (I8)	22	70%
			23	80%
			24	90%
Learning and growth	Strategic competency integration	% of integration (L9)	25	Year 1 – 0%, Year 3 – 55%, Year 5 – 100%
			26	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%
			27	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%
	Strategic technology reliability	Reliability rate (L10)	28	Year 1 – 100%
			29	Year 2 – 100%
			30	Year 3 – 100%
	Strategic climate	Professional employee CPE (L11.1)	31	Year 1 – 100%
			32	Year 2 – 100%
		Employee response rate (L11.2)	33	Year 1 – 100%
			34	Year 2 – 100%

For example, party B assigned a score of 20 for 30%CAGR for F1 (Table 2, cell B1), and 5 for 25%CAGR (Table 2, cell B2), which is an indicator of preference difference. The 20%CAGR is shown as 0 for party B (Table 2, cell C1), indicating an unacceptable preference. From Table 2, we see that

Table 2. Scored Template and Critical Ratios.

Measurement		Target	Payoff		Increment to A	Decrement to B	Critical Ratio
			CEO; B	SBU manager; A			
		[A]	[B]	[C]	[D]	[E]	[F]
Earnings per share	1	30%CAGR	**20**	0	–	–	–
(F1)	2	25%CAGR	5	2	2	15	0.133333
	3	20%CAGR	0	**5**	3	5	0.6
Sales (F2)	4	25%CAGR	**10**	0	–	–	–
	5	20%CAGR	3	3	3	7	0.428571
	6	15%CAGR	0	**5**	2	3	0.666667
Cost reduction (F3)	7	5%CAGR	**3.5**	0	–	–	–
	8	3%CAGR	0	**3**	3	3.5	0.857143
Expert rankings	9	#1 in Year 2	**5**	0	–	–	–
(C4.1)	10	#2 in Year 2	0	**7**	7	5	1.4
Customer rankings	11	#1 in Year 2	**10**	0	–	–	–
(C4.2)	12	#2 in Year 2	0	**4**	4	10	0.4
Repeat customers	13	50%	**5**	0	–	–	–
(C5)	14	60%	1	3	3	4	0.75
	15	70%	0	**11**	8	1	8
% increase-	16	12% p.a.	**10**	0	–	–	–
customer (C6)	17	8% p.a.	0	**5**	5	10	0.5
Average stage gate	18	20 months	**5**	0	–	–	–
time (I7)	19	25 months	4	3	3	1	3
	20	30 months	1	13	10	3	3.333333
	21	35 months	0	**30**	17	1	17
Cost reduction	22	70%	**5**	0	–	–	–
success rate (I8)	23	80%	1	3.5	3.5	4	0.875
	24	90%	0	**10**	6.5	1	6.5
% of integration	25	Year 1 – 0%, Year 3 – 55%, Year 5 – 100%	**5**	0	–	–	–
(L9)	26	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%	1	1.5	1.5	4	0.375
	27	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%	0	**5**	3.5	1	3.5
Reliability rate	28	Year 1 – 100%	**5**	0	–	–	–
(L10)	29	Year 2 – 100%	3	3	3	2	1.5
	30	Year 3 – 100%	0	**5**	2	3	0.666667
Professional	31	Year 1 – 100%	**10**	0	–	–	–
employee CPE (L11.1)	32	Year 2 – 100%	0	**3**	3	10	0.3
Employee	33	Year 1 – 100%	**6.5**	0	–	–	–
experience rate	34	Year 2 – 100%	0	**7**	7	6.5	1.076923
(L11.2)	35		**100**	**100**			

SBU's strategic theme will take 5 years to implement fully, as is indicated by year 5 in measurement L9 – % of integration.

The payoff columns indicate that the SBU manager has allocated the highest and most points (Table 2, cells C21 and C19, C20), placing more importance on internal business perspective, and the CEO (Table 2, cells B1 and B2) has placed more importance on the financial perspective. We assume that the SBU manager and CEO had determined their reservation values as 65 and 40, respectively (see cells J52 and K52 in Table 6), which specify the minimum value that will be acceptable in their negotiations. The reservation values could be the sum of the weights of a few selected objectives that the CEO and SBU manager view as most important. The CEO and SUB manager follow with a rank ordering of the importance of different within issue targets levels (e.g., partial scoring; Table 2, cell B2). For each issue, Table 2 lists the CEO's and the SBU manager's target ranking in descending (ascending) order. The increment to party A (SBU) (Table 2, column D) and decrement to party B (CEO) (Table 2, column E) show the changes going to lower levels of the CEO's preference and higher levels of the SBU's preferences. The increment to party A in Table 2, cell D2 = cells (C2–C1), and the increment to party B in Table 2, cell E2 = cells (B1–B2). The critical ratios (in Table 2, column F) are computed by dividing the increment to A (cells in Table 2, column D) by the decrement to B (cells in Table 2, column E) for each target performance level.

Using deal from the top (DFT), we sort the BSC issues, corresponding performance levels within each issue, the associated payoffs for party A and party B in descending order of the critical ratios. This can easily be done using the Microsoft Excel sort function (i.e., we sort Table 2 by descending order of column F). We recommend copying Table 2 to another area in the worksheet and then sorting for clarity. Table 3 presents the contracts sorted in descending order of the critical ratios. The next step in the DFT procedure is to identify the extreme efficient contracts. The DFT procedure first gives everything to party B (payoff 100, Table 3, column H) and nothing to party A (payoff 0, Table 3, column G). For each critical ratio (going from highest to lowest as shown in Table 3), DFT gives the corresponding increment to party A and the corresponding decrement to party B keeping a track of the corresponding extreme efficient contracts, as shown in Table 4. The plot of Table 3, columns G and H, provides the efficient contract frontier shown in Fig. 2.

We next solve a series of three mathematical programming models developed in Herath et al. (2009) to identify the a set of BSC contracts that increase the joint value to both parties. The three models have a common set

Table 3. Extreme Efficient Contracts Sorted According to Critical Ratios.

Performance Measure		Target	Payoff		Increment A	Decrement B	Critical Ratio	Extreme Efficient Values	
			SBU manager; A	CEO; B				SBU manager; A	CEO; B
		[A]	[B]	[C]	[D]	[E]	[F]	[G] 0	[H] 100
Average stage gate time (I7)	71	35 months	30	0	17	1	17	17	99
Repeat customers (C5)	52	70%	11	0	8	1	8	25	98
Cost reduction success rate (I8)	53	90%	10	0	6.5	1	6.5	31.5	97
% of integration (L9)	54	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%	5	0	3.5	1	3.5	35	96
Average stage gate time (I7)	55	30 months	13	1	10	3	3.333333	45	93
Average stage gate time (I7)	56	25 months	3	4	3	1	3	48	92
Reliability rate (L10)	57	Year 2 – 100%	3	3	3	2	1.5	51	90
Expert ranking (C4.1)	58	#2 in Year 2	7	0	7	5	1.4	58	85
Employee response rate (L11.2)	59	Year 2 – 100%	7	0	7	6.5	1.076923	65	78.5
Cost reduction success rate (I8)	60	80%	3.5	1	3.5	4	0.875	68.5	74.5
Cost reduction (F3)	61	3%CAGR	3	0	3	3.5	0.857143	71.5	71
Repeat customers (C5)	62	60%	3	1	3	4	0.75	74.5	67
Sales (F2)	63	15%CAGR	5	0	2	3	0.666667	76.5	64
Reliability rate (L10)	64	Year 3 – 100%	5	0	2	3	0.666667	78.5	61
Earning per share (F1)	65	20%CAGR	5	0	3	5	0.6	81.5	56
% increase-customer (C6)	66	8% p.a.	5	0	5	10	0.5	86.5	46
Sales (F2)	67	20%CAGR	3	3	3	7	0.428571	89.5	39

Table 3. (*Continued*)

Performance Measure		Target	Payoff		Increment A	Decrement B	Critical Ratio	Extreme Efficient Values	
			SBU manager; A	CEO; B				SBU manager; A	CEO; B
		[A]	[B]	[C]	[D]	[E]	[F]	[G] 0	[H] 100
Customer rankings (C4.2)	**68**	#2 in Year 2	**4**	0	4	10	0.4	93.5	29
% of integration (L9)	**69**	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%	1.5	1	1.5	4	0.375	95	25
Professional employee CPE (L11.1)	**70**	Year 2 – 100%	**3**	0	3	10	0.3	98	15
Earning per share (F1)	**71**	25%CAGR	2	5	2	15	0.133333	100	0
Earning per share (F1)	**72**	30%CAGR	0	**20**					
Sales (F2)	**73**	25%CAGR	0	**10**					
Cost reduction (F3)	**74**	5%CAGR	0	**3.5**					
Expert ranking (C4.1)	**75**	#1 in Year 2	0	**5**					
Customer rankings (C4.2)	**76**	#1 in Year 2	0	**10**					
Repeat customers (C5)	**77**	50%	0	**5**					
% increase-customer (C6)	**78**	12% p.a.	0	**10**					
Average stage gate time (I7)	**79**	20 months	0	**5**					
Cost reduction success rate (I8)	**80**	70%	0	**5**					
% of integration (L9)	**81**	Year 1 – 0%, Year 3 – 55%, Year 5 – 100%	0	**5**					
Reliability rate (L10)	**82**	Year 1 – 100%	0	**5**					
Professional employee CPE (L11.1)	**83**	Year 1 – 100%	0	**10**					
Employee response rate (L11.2)	**84**	Year 1 – 100%	0	**6.5**					

Table 4. Extreme Efficient Contracts – SBU Manager (Party A) Contracting.

Performance Measure	Target	Extreme Efficient Contracts												
		Earnings per share (F1)	Sales (F2)	Cost reduction (F3)	Expert ranking (C4.1)	Customer ranking (C4.2)	Repeat customers (C5)	% increase-customer (C6)	Average stage gate time (I7)	Cost reduction success rate (I8)	% of integration (L9)	Reliability rate (L10)	Professional employee CPR (L11.1)	Employee response rate (L11.2)
		30%CAGR	25%CAGR	5%CAGR	#1 in Year 2	#1 in Year 2	50%	12% p.a.	20 months	70%	Year 1 – 0%, Year 3 – 90%, Year 5 – 100%	Year 1–100%	Year 1–100%	Year 1–100%
Average stage gate time (I7)	35 months								35 months					
Repeat Customers (C5)	70%						70%							
Cost reduction success rate (I8)	90%									90%				
% of integration (L9)	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%										Year 1 – 0%, Year 3 – 45%, Year 5 – 100%			
Average stage gate time (I7)	30 months								30 months					
Average stage gate time (I7)	25 months								25 months					
Reliability rate (L10)	Year 2 – 100%											Year 2–100%		
Expert ranking (C4.1)	#2 in Year 2				#2 in Year 2									
Employee response rate (L11.2)	Year 2 – 100%													Year 2–100%
Cost reduction success rate (I8)	80%									80%				
Cost reduction (F3)	3%CAGR			3%CAGR										
Repeat customers (C5)	60%						60%							
Sales (F2)	15%CAGR		15%CAGR											
Reliability rate (L10)	Year 3 – 100%											Year 3–100%		
Earning per share (F1)	20%CAGR	20%CAGR												
% increase-customer (C6)	8% p.a.							8% p.a.						
Sales (F2)	20%CAGR		20%CAGR											
Customer rankings (C4.2)	#2 in Year 2					#2 in Year 2								
% of integration (L9)	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%										Year 1 – 0%, Year 3 – 50%, Year 5 – 100%			
Professional employee CPE (L11.1)	Year 2 – 100%												Year 2–100%	
Earning per share (F1)	25%CAGR	25%CAGR												

Fig. 2.   Extreme Efficient Contracts and Optimal Contract Values.

of constraints but different objective functions. The three objective functions are: (1) maximize the sum of payoffs to both parties; (2) maximize the product of excesses of A and B; and (3) maximize (minimum of proportion to A or B). The constraints are: (i) only one performance level can be selected for each measure; (ii) excess for each party has to be nonnegative; and (iii) decision variables have to be nonnegative. The two parties then can choose one of the optimal solutions of the above three models as the desired BSC contract. We use the Microsoft Excel Solver to find the optimal or approximately optimal solutions of the three models.

We define Table 5 cell range K1:K34 as the decision variables for Microsoft Excel Solver program that will take 1 if a target level is selected and 0 otherwise. First we discuss how we solved Model 1 – maximize the sum of payoffs. The contact values for party A and B (Table 6, cell J51 and K51) are computed with Table 5 columns I, K data using the Microsoft Excel formula SUMPRODUCT(I1:I34,K1:K34) and SUMPRODUCT(I1:I34,J1:J34). The objective function for Model 1 is given in Table 6, cell J56 as SUM(J51:K51). The Microsoft Solver program can be selected using Tools and then clicking on SOLVER in the dropdown menu. In order to define the objective function for Model 1 we input cell J56 as the "Set Target Cell" then select "Max" in the Solver Program. Next in the "by changing column" we insert the decision variables (Table 5, cells K1:K34).

Table 5. Mathematical Programming Solution – A Feasible Contract.

Performance Measure		Level	Payoff		Contract	Recomputed BSC Weights (Jointly Scored)
			SBU manager; A	CEO; B		
		[H]	[I]	[J]	[K]	[L]
Earning per share (F1)	1	30%CAGR	0	**20**	1.00	**14.3%**
	2	25%CAGR	2	5	0.00	
	3	20%CAGR	5	0	0.00	
Sales (F2)	4	25%CAGR	0	**10**	1.00	**7.2%**
	5	20%CAGR	3	3	0.00	
Cost reduction (F3)	6	15%CAGR	5	0	0.00	
	7	5%CAGR	0	**3.5**	1.00	**2.5%**
	8	3%CAGR	3	0	0.00	
Expert ranking (C4.1)	9	#1 in Year 2	0	5	0.00	
	10	#2 in Year 2	**7**	0	1.00	**5%**
Customer ranking (C4.2)	11	#1 in Year 2	0	**10**	1.00	**7.2%**
	12	#2 in Year 2	4	0	0.00	
Repeat customers (C5)	13	50%	0	5	0.00	
	14	60%	3	1	0.00	
	15	70%	**11**	0	1.00	**7.9%**
% increase-customer (C6)	16	12% p.a.	0	**10**	1.00	
	17	8% p.a.	**5**	0	0.00	**7.2%**
Average stage gate time (I7)	18	20 months	0	5	0.00	
	19	25 months	3	4	0.00	
	20	30 months	13	1	0.00	
	21	35 months	**30**	0	1.00	**21.5%**
Cost reduction success rate (I8)	22	70%	0	5	0.00	
	23	80%	3.5	1	0.00	
	24	90%	**10**	0	1.00	**7.2%**
% of integration (L9)	25	Year 1 – 0%, Year 3 – 55%, Year 5 – 100%	0	5	0.00	
	26	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%	1.5	1	0.00	
	27	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%	**5**	0	1.00	**3.6%**
Reliability rate (L10)	28	Year 1 – 100%	0	5	0.00	
	29	Year 2 – 100%	3	3	1.00	**4.3%**
	30	Year 3 – 100%	5	0	0.00	
Professional employee CPE (L11.1)	31	Year 1 – 100%	0	**10**	1.00	**7.2%**
	32	Year 2 – 100%	3	0	0.00	
Employee response rate (L11.2)	33	Year 1 – 100%	0	**6.5**	0.00	
	34	Year 2 – 100%	7	0	1.00	**4.9%**
	35	Value	73.00	66.50		**100%**

Table 6. Jointly Optimal Contract Values for Different Objective
Function Criteria.

		[H]	[I]	SBU Manager A	CEO B
				[J]	[K]
Contract values	51			73.00	66.50
Reservation values	52			65	40
Excess values	53			8.00	26.50
Maximum feasible values	54			88.00	74.29
Proportion of potential	55			0.35	0.77
(a) Sum	56			139.50	
(b) Product of excess	57			212.00	
(c) Minimum POP	58			0.3478	
	59				
Maximize	60	Strategies	A	B	Minimum POP
Sum	61	Mixed	70.14	69.36	0.224
	62	Pure	73.00	66.50	0.348
Product of excess	63	Mixed	78.00	60.00	0.565
	64	Pure	78.00	60.00	0.565
Minimum POP	65	Mixed	78.14	59.59	0.571
	66	Pure	76.00	59.50	0.48

The three constraints are set up as follows. For constraint 1, which is to pick one target level for each performance measure – for example, for measure earnings per share (F1) we insert Table 5, cells K1:K3 < =1 in the "Subject to the Constraints" item in the Microsoft Solver. We repeat this for each of the other 12 performance measures. Constraint 2 – excess for each party has to be nonnegative, which ensures that the joint payoff values should be greater than the reservation values. First, we compute the excess value for party A and party B in Table 6 cell J53 and K53 as the difference between the payoff value and the reservation value, given by Table 6 cell J53 = J51–J52 and cell K53 = K51–K52. Now the constraint 2 can be inserted in Microsoft Solver as J53:K53 > 0. Finally, the constraint 3 ensures that the decision variables cannot be negative. This is ensured by inserting Table 5 cells K1:K34 > =0 and K1:K34 < =1. Next, we solve the model by clicking on the SOLVE button. Notice in this particular model run we did not restrict the decision variable to integers (0 or 1) because the linear solution provides the maximum feasible values (Table 6, cell J54:K54), which is required for computing the objective function values for Models 2 and 3.

In Table 5, column K, we show a feasible contract for the two parties, which is the solution of Model 1 without integer restrictions. The optimal target levels associated with the contract are indicated by a 1.00 in the contract column. Thus, for example, the earnings per share (F1) is 30%CAGR and expert ranking (C4.1) is #2 in year 2. The payoff column (Table 5, cells I35:J35) shows total contract values for the SBU manager and CEO as 73.00 and 66.50, respectively, which totals 139.5. For the contract, the values for the 13 measures are divided by 139.5 to get the recomputed BSC weights, which are jointly scored in the process (see Table 5, column L). For example, the F1 weight is shown as 14.3% (20/139.5). Table 5 shows that the optimal target levels for F1, F2, F3, C4.2, C6, and L11.1 are the CEO's preference, and the remaining targets are the SBU manager's preference except for L10, which was ranked second by both parties.

Table 6 shows the maximum feasible values for the SBU manager and the CEO as 88 and 74.29, respectively. The contract values for the CEO exceed the reservation value by 26.50 as compared to an excess of 8.00 for the SBU manager. Next, we solve Model 2 with the objective function maximizing the product of the excesses. This is done by replacing the "Set Target Cell" which is preset for Model 1 with product of excesses computed in Table 6, cell J57 as $J53 \times B53$. Notice that the set of constraints are identical for Model 2. For Model 3 with the objective function, maximizing the minimum proportion of potential (POP), we first compute the proportion of potential in Table 6, cells J55 and K55 as follows. The POP for each party is the excess value divided by the difference between maximum feasible value minus the reservation value (i.e., J53/(J54–J52) for party A and K53/(K54–K52) for party B). Once the POP values for both parties A and B are found, we define the minimum of the POP in Table 6 cell J58 as Min(J55,K55). Next, we insert Table 6 cell J58 in the "Set Target Cell" which is preset for Model 1 and maximize the objective function with the same set of constraints. When the model solutions are linear, they are called mixed or randomized strategies; and fractional acceptance of any target level is feasible. In order to obtain the pure contracts (with 0's and 1's), we solve each model with an integer constraint. This can be done in Microsoft Excel Solver by imposing the integer restriction in the constraint section. We relax this constraint to get above mixed strategies. The three objective criteria solution values for the SBU manager and the CEO for both mixed and pure strategies are compared in Table 7.

The joint optimal contracts pertaining to the three different objective criteria are given in Table 7. For the maximizing the sum of the two payoffs objective functions, Table 7 shows that the same level for both the mixed

Table 7. Joint Optimal Contracts for Mixed and Pure Strategies.

Performance Measure		Target	Maximize Sum		Maximize Product of Excess		Maximize Minimum POP	
			Mixed	Pure	Mixed	Pure	Mixed	Pure
		[M]	[N]	[O]	[P]	[Q]	[R]	[S]
Earning per share (F1)	1	30%CAGR	1.00	1.00	1.00	1.00	1.00	1.00
	2	25%CAGR	0.00	0.00	0.00	0.00	0.00	0.00
	3	20%CAGR	0.00	0.00	0.00	0.00	0.00	0.00
Sales (F2)	4	25%CAGR	1.00	1.00	1.00	1.00	1.00	0.00
	5	20%CAGR	0.00	0.00	0.00	0.00	0.00	1.00
	6	15%CAGR	0.00	0.00	0.00	0.00	0.00	0.00
Cost reduction (F3)	7	5%CAGR	1.00	1.00	1.00	1.00	1.00	1.00
	8	3%CAGR	0.00	0.00	0.00	0.00	0.00	0.00
Expert ranking (C4.1)	9	#1 in Year 2	0.00	0.00	0.00	0.00	0.00	0.00
	10	#2 in Year 2	1.00	1.00	1.00	1.00	1.00	1.00
Customer ranking (C4.2)	11	#1 in Year 2	1.00	1.00	1.00	1.00	1.00	1.00
	12	#2 in Year 2	0.00	0.00	0.00	0.00	0.00	0.00
Repeat customers (C5)	13	50%	0.00	0.00	0.00	0.00	0.00	0.00
	14	60%	0.00	0.00	0.00	0.00	0.00	0.00
	15	70%	1.00	1.00	1.00	1.00	1.00	1.00
% increase-customer (C6)	16	12% p.a.	1.00	1.00	1.00	1.00	1.00	1.00
	17	8% p.a.	0.00	0.00	0.00	0.00	0.00	0.00

Average stage gate time (I7)	**18**	20 months	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	19	25 months	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	20	30 months	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	21	35 months	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Cost reduction success rate (I8)	**22**	70%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	23	80%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	24	90%	1.00	1.00	1.00	1.00	1.00	1.00	1.00
% of integration (L9)	**25**	Year 1 – 0%, Year 3 – 55%, Year 5 – 100%	0.57	0.00	0.00	0.00	0.00	0.00	0.00
	26	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	27	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%	0.43	1.00	1.00	1.00	1.00	1.00	1.00
Reliability rate (L10)	**28**	Year 1 – 100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	29	Year 2 – 100%	1.00	1.00	0.00	0.00	1.00	0.00	0.00
	30	Year 3 – 100%	0.00	0.00	1.00	1.00	0.00	1.00	1.00
Professional employee CPE (L11.1)	**31**	Year 1 – 100%	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	32	Year 2 – 100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Employee response rate (L11.2)	**33**	Year 1 – 100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	34	Year 2 – 100%	1.00	1.00	1.00	1.00	1.00	1.00	1.00

and pure strategies (indicated by 1.00), except for % of integration (L9). For L9, the 0.57 and 0.43 indicate the mix in the solution. Using the maximizing the product of the excesses objective function, there is complete agreement on the levels. In contrast, maximizing the minimum proportion of potential objective function shows the greatest amount of disagreement in our example (F2, F3, and L10). In the selection between a mixed or pure strategy, there are also differences in the contracts associated with the different objective functions. The two parties have a range of optimal contracts to consider, rather than a single contract. Table 8 shows the weights that the analytical model generates for optimal contracts for the pure and mixed strategies.

The extreme efficient contracts and optimal contracts are shown in Fig. 2. The optimal contracts lie within the feasibility region, which is the northeast of the joint reservation values bounded by the efficient frontier. In order for a contract to be legitimate, the excess value (the difference between the contract value and the reservation value) for each party has to be nonnegative. Notice that the optimal contracts shown in Fig. 2 are in the legitimate space.

Our example illustrates joint optimal contracts pertaining to the three different objective criteria. Maximizing the sum is not attractive to many parties because of the inequality that usually results. The two leading choices of an equitable point on the efficient frontier is maximizing the minimum POP and maximizing the product of excesses. Maximizing the minimum POP gives each party the same POP values. The Maximizing the product of the excesses provides the same result for both mixed and pure contracts, which is known as the Nash solution. Consequently, the SBU manager can choose between the mixed and pure optimal contracts, given that the CEO has agreed to contract selection based on analytical methods. Suppose the CEO and SBU manager has agreed on the BSC targets and weights resulting from maximizing the product of excess (pure strategy). The jointly selected weights for each objective are given in column 6 in Table 8. In Table 9 we compare these jointly selected weights for each objective and each BSC perspective with the CEO's imposed weights under the traditional approach.

Our results indicate that the relative importance jointly assigned by the CEO and SBU manager for each of the four BSC perspectives are 23.9% financial, 27.5% customer, 28.9% internal business, and 19.5% learning and growth. Compared with the jointly selected weights, if the BSC weights were assigned using the traditional approach, CEP preferences would have most likely to have dominated the assignment. Thus, the imposed weights for each of the four measures would be financial (33.5%), customer (30%),

Table 8. Joint Optimal Contract Weights for Mixed and Pure Strategies.

Performance Measure	Target	Maximize Sum		Maximize Product of Excess		Maximize Minimum POP	
		Mixed	Pure	Mixed	Pure	Mixed	Pure
Earning per share (F1)	30%CAGR	14.3%	14.3%	14.5%	14.5%	14.4%	14.8%
	25%CAGR						
	20%CAGR						
Sales (F2)	25%CAGR	7.2%	7.2%	7.2%	7.2%	7.2%	
	20%CAGR						4.4%
	15%CAGR						
Cost reduction (F3)	5%CAGR	2.5%	2.5%				2.6%
	3%CAGR			2.2%	2.2%	2.2%	
Expert ranking (C4.1)	#1 in Year 2						
	#2 in Year 2	5.0%	5.0%	5.1%	5.1%	5.1%	5.2%
Customer ranking (C4.2)	#1 in Year 2						
	#2 in Year 2	7.2%	7.2%	7.2%	7.2%	7.2%	7.4%
Repeat customers (C5)	50%						
	60%						
	70%	7.9%	7.9%	8.0%	8.0%	8.0%	8.1%
% increase-customer (C6)	12% p.a.	7.2%	7.2%	7.2%	7.2%	7.2%	7.4%
	8% p.a.						
Average stage gate time (I7)	20 months						
	25 months						
	30 months						
	35 months	21.5%	21.5%	21.7%	21.7%	21.8%	22.1%
Cost reduction success rate (I8)	70%						
	80%						
	90%	7.2%	7.2%	7.2%	7.2%	7.3%	7.4%
% of integration (L9)	Year 1 – 0%, Year 3 – 55%, Year 5 – 100%						
	Year 1 – 0%, Year 3 – 50%, Year 5 – 100%						
	Year 1 – 0%, Year 3 – 45%, Year 5 – 100%	1.5%	3.6%	3.6%	3.6%	3.6%	3.7%
Reliability rate (L10)	Year 1 – 100%						
	Year 2 – 100%	4.3%	4.3%				4.4%
	Year 3 – 100%			3.6%	3.6%	3.6%	
Professional employee CPE (L11.1)	Year 1 – 100%	7.2%	7.2%	7.2%	7.2%	7.2%	7.4%
	Year 2 – 100%						
Employee response rate (L11.2)	Year 1 – 100%	5.0%	5.0%	5.1%	5.1%	5.1%	5.2%
	Year 2 – 100%						
		100%	100%	100%	100%	100%	100%

Table 9.   Comparison of Targets and Weights Joint Selection
vs. Imposed.

BSC		Target (weight)	
Perspective	Goals	Joint Selection	If Imposed by CEO
Financial	Profitability	30%CAGR (14.5%)	30%CAGR (20%)
	Sales growth	25%CAGR (7.2%)	25%CAGR (10%)
	Reduce cost per unit	3%CAGR (2.2%)	5%CAGR (3.5%)
		Total financial (23.9%)	Total financial (33.5%)
Customer	Customer intimacy	#1 in Year 2 (5.1%)	#1 in Year 2 (5%)
	Customer satisfaction	#1 in Year 2 (7.2%)	#1 in Year 2 (10%)
		50% (8%)	50% (5%)
	Expand customer base	12% p.a. (7.2%)	12% p.a. (10%)
		Total customer (27.5%)	Total customer (30%)
Internal	Product innovation	35 months (21.7%)	20 months (5%)
	Product efficiency	90% (7.2%)	70% (5%)
		Total internal (28.9%)	Total internal (10%)
Learning and growth	Strategic competency integration	Year 1 – 0%, Year 3 – 45%, Year 5 – 100% (3.6%)	Year 1 – 0%, Year 3 – 55%, Year 5 – 100% (5%)
	Strategic technology reliability	Year 3 – 100% (3.6%)	Year 1 – 100% (5%)
	Strategic climate	Year 1 – 100% (7.2%)	Year 1 – 100% (10%)
		Year 1 – 100% (5.1%)	Year 1 – 100% (6.5%)
		Total learning and growth (19.5%)	Total learning and growth (26.5%)

internal business (10%), and learning and growth (26.5%). The imposed weights are biased in favor of financial and customer measures. On the other hand, the jointly selected weights are better balanced between financial and nonfinancial measures.

CONCLUSIONS

We have illustrated how the collaborative BSC target and weight model developed in Herath et al. (2009) which allows for the selection of financial

and nonfinancial targets and weights that are optimal or approximately optimal and can be implemented in Microsoft Excel. Recent studies in the BSC literature report on the superiors' performance evaluations being biased toward using common measures and biased against using unique measures resulting in BSC conflicts. The model presented in this paper reduces the weighting bias against unique measures and considers the preference set of multiple actors in selecting performance targets and weights. The model should be a positive factor in enhancing managers' knowledge of strategic linkages, enhancing reliability of data and also addresses employee concerns regarding targets, their viability, and probability of success.

The collaborative BSC target and weight model is potentially useful in organizations where there is a potential for the parties to agree on the collaborative requirements. We discuss its importance in the context of Kaplan and Norton (2006) emphasis on aligning organizational units, employees, management processes, and systems to strategy. The collaborative BSC target and weight model can be used both in planning (strategy-setting stage) and the performance evaluation stage (compensation link) of a BSC process. First, in planning stage it can be used to align business units and employees by selecting the measures and targets by considering jointly the preferences of actors. In the performance evaluation stage, the collaborative BSC model determines the optimal set of weights that enhance the value to both parties. This BSC target model is a technique management accounting practitioners can use to minimize or eliminate conflict resolution, reducing the time required to set targets.

Accounting educators may find the collaborative BSC target and weight model to be a useful tool for innovation in teaching the BSC. It can contribute to depth of learning about the BSC model. Using the model can provide student insight into the importance of target setting and the challenge of resolving conflicts. Students can experience using a quantitative model and using the Solver Program in Microsoft Excel.

NOTE

1. We limited our illustration to 13 performance measures for demonstration purposes, keeping the figures and tables to a reasonable size. There are only two internal process measures as compared to 15–20 that are illustrated in some BSC examples in the literature.

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EXAMINING BOTH SIDES OF STAKEHOLDER ENGAGEMENT: BEHAVIORAL IMPLICATIONS IN INTERORGANIZATIONAL ALLIANCES

Jane Cote and Claire Kamm Latham

ABSTRACT

Building on prior research linking stakeholder relationship quality with financial performance, we explore interorganizational engagement from a bilateral perspective, more fully representing the dynamics within an alliance. Interorganizational relationship quality and stakeholder management theory in healthcare and in accounting research provide the foundation for these insights.

While the study's findings demonstrate consistent views regarding the importance of relationship management and patient care, the two stakeholder groups hold divergent perspectives on how to accomplish these goals. Insurance executives take a population perspective, whereas physician practices focus their decision making at the patient level. The relative power and size between stakeholders was instrumental in how insurers chose to develop relationships with individual

physician practices. These findings provide the nucleus for understanding reported frictions.

INTRODUCTION

When stakeholders make the effort to construct and implement a relationship that is mutually advantageous, positive outcomes can be achieved both operationally and financially (Foster & Jonker, 2005). In contrast, ineffective and inefficient stakeholder engagement leads to negative outcomes such as revenue loss and increased costs. Stakeholder engagement, however, as Foster and Jonker (2005, p. 53) assert, is rapidly becoming "a situation of increasing complexity with divergent values and interests," escalating the difficulty of avoiding such negative outcomes. As firms look to nonfinancial attributes that impact their cost structures, exploring stakeholder relationships becomes a necessary avenue of study.

Stakeholder theory provides insight into the development of the strong relational bonds essential to successful engagement. In a two-stage analysis, firms first identify which stakeholders provide the critical resources necessary for their long-term success, as defined by their strategic positioning. Second, they must identify what is important to these stakeholders in order to build strategic partnerships that create sustainable competitive advantage (Barney, 1991; Grant, 1991; Cote, Cote, Goodstein, & Latham, 2008). This two-step assessment is especially essential in industry settings where relationship frictions are present. Cote and Latham (2006) explore interorganizational engagement in one such setting, the healthcare industry. Examining behavioral components of the insurer–physician practice relationship from the physician practice perspective, they illustrate how understanding the relational bonds in stakeholder engagement, particularly in those alliances in which friction is present, provides opportunities to improve cost structure, increase financial accountability, and enhance relationship effectiveness and efficiency. They further demonstrate that trust and commitment within the stakeholder engagement directly impacts relationship quality and ultimately financial performance. However, as in their study, what is absent from most stakeholder engagement research is the view from multiple stakeholder vantage points. Crane and Livesey (2003) portray the stakeholder relationship as an increasingly intricate and nebulous web of challenged interactions between entities. Therefore, expanding our understanding of interorganizational engagement from a multistakeholder perspective is necessary.

The purpose of this study is to build this bilateral perspective. Using the healthcare context explored in prior research, we now examine stakeholder engagement from both the physician practice and the insurance company vantage points. Specifically, our focus is to determine whether previous findings (Cote & Latham, 2006) are symmetrical, meaning whether insurance companies put similar emphasis on the components of relationship quality as critical aspects of cost management. Without this two-sided investigation, our understanding about how organizations engage stakeholders to enhance performance is incomplete. This industry, where the potential for stakeholder friction is severe yet where only one perspective has been presented previously, offers a rich context to explore how stakeholders manage their relationships with each other.

The remainder of the paper is organized as follows. We outline the conceptual framework for the study in the next section. Research design and sample methodology are included in the third section followed by our results. We conclude with a summary discussion including limitations and implications for future research.

CONCEPTUAL FRAMEWORK

We are guided in this study by several interlocking streams of research. First, we rely upon stakeholder theory to support that it is the development of strong relational bonds that can drive organizational success. Stakeholder theory has been relied upon in the healthcare industry to frame the discussion related to the multiple boundary spanning relationships. It also has growing interest from within the accounting discipline. Second, relationship quality is modeled and empirically explored in research emanating from the marketing literature but adopted in numerous contexts such as government, entrepreneurship, management control systems, finance, and healthcare (e.g., McLaughlin, Osborne, & Chew, 2009; Nguyen & Rose, 2009; Velez, Sanchez, & Alvarez-Dardet, 2008; DeClercq & Rangarajan, 2008; Liang & Wang, 2008; Doucette, 1999). Finally, healthcare relationships have primarily been explored through the physician to patient axis or the physician to pharmacist axis, with relatively little investigation into the physician to insurance company axis (Berry et al., 2008; Chang, Gotcher, & Chan, 2006; Zillich, Doucette, Carter, & Kreiter, 2005; Weng, Chen, & Chen, 2008). We use these foundations as the conceptual support that frames this study to analyze the relationship between the insurance company and physician practice through the lens of the insurance company.

Stakeholder Theory Within Healthcare

Stakeholder theory is organized around two central questions (Freeman, 1994; Freeman, Wicks, & Parmar, 2004). The first examines the purpose of the firm. Firms need to articulate the ways in which they create value and competitive advantage. This provides the starting point for identifying the stakeholders instrumental in providing the resources needed to create value (Cote et al., 2008). The identification of relevant stakeholders leads to the second central question that specifies how to develop these relationships that will lead to reciprocal benefits.

While organizations strive for financial success, this is an outcome. Outcomes are accomplished through attention to a causal set of inputs (Atkinson, Waterhouse, & Wells, 1997; Cote et al., 2008). Value is created when the resources provided are intangible, socially complex, and causally ambiguous (Barney, 1991; Grant, 1991). Tangible resources can often be replicated by others. Socially complex and causally ambiguous relationships create a commitment that has benefits in excess of those that exist in a purely transactional-based relationship. These unique resources create capabilities for the organization that are rare, valuable, and enduring (Barney, 1991; Grant, 1991). Close analysis demonstrates that the development of strategic partnerships with key stakeholders provides the resources that organizations need to create a sustainable competitive advantage (Freeman, 1994; Freeman et al., 2004).

The healthcare industry is one in which stakeholders must cooperate to survive in this competitive and quickly changing environment. Prior to the mid-20th century, medical services involved two stakeholders: the physician and the patient (Angell, 1993). The relationship was direct, personal, and structured as fee for service. This changed when employers began to offer health insurance to employees, which occurred to avoid wage controls in place during WWII (Angell, 1993). Now the physician and patient arrangement added employers and insurance companies to the relationship. This not only changed the payment structure but created indirect relationships that complicate the coordination of healthcare delivery.

With central organizing principles of purpose and relationships, stakeholder theory has been instrumental in defining how to structure and manage relationships among the various stakeholders in the healthcare industry. Within the healthcare industry alone, there has been work to understand how stakeholders within healthcare coordinate efforts (Blair & Buesseler, 1998) and the role that power has to influence the relationship dynamics (Daake & Anthony, 2000). Consequently, stakeholder theory and frameworks are critical underpinnings to guide investigations of the healthcare industry frictions.

Stakeholder Theory and Accounting Research

The accounting profession, with its audit and measurement functions, serves numerous stakeholder groups. Roberts and Mahoney (2004) classify stakeholder-based accounting research into three categories: managerial agency, organizational, and societal. At the managerial agency level, the focus has been on earnings management. Stakeholders are defined as those claimants who are nonstockholders (Bowen, Johnson, Shevlin, & Shores, 1992). Stakeholders are assumed to have less power than shareholders with management using accounting policies to exploit their interests. Another set of studies examines the role that accounting has in the reporting of social and environmental events (Ullman, 1985; Li, Richardson, & Thornton, 1997). Issues related to voluntary disclosure and the degree to which management must acquiesce to stakeholders are examined. Both streams of research in the managerial agency level place the role of stakeholder-based accounting as a defensive mechanism rather than an opportunity for strategic alignment with key stakeholders.

Stakeholder-based accounting research at the organizational and societal levels emphasizes the stewardship role that accounting occupies. Stewardship is framed as maintaining the integrity of financial information relied upon by a broad set of stakeholders including stockholders, government, employees, and the public (Roberts & Mahoney, 2004). Corporate social responsibility and reporting are explored to propose the responsibility management has for informing the public about their actions (Gray, Kouhy, & Lavers, 1995; Rubenstein, 1992). Accounting is then a mechanism to 'level the playing field' among stakeholders (Beets & Souther, 1999). Therefore, regulatory changes in external reporting are tools to balance the power between stockholders and other stakeholders.

Research in accounting has emphasized the stakeholders who are direct beneficiaries of financial reporting. It has examined the issues affecting noninvestor stakeholders and provided remedies for power imbalances. While much accounting research focuses on stakeholder-type issues, rarely does stakeholder theory serve as the theoretical foundation for the research. Accounting research can add to the discussions surrounding stakeholder theory by assessing the impact that intangible relationships have on organizational performance. Stakeholder relationships and their impact on performance measurement is one direct avenue that can unite the accounting literature with stakeholder theory. With its emphasis on organizational purpose and relationships, the stakeholder theoretical framework can provide insights into the power that accounting has to shape stakeholder relationships and benefits.

Interorganizational Relationship Quality

Savage, Nix, Whitehead, and Blair (1991) further our understanding of how organizations such as insurance companies and physician practices work together. They categorize the strategy that one stakeholder will take when working with another as the degree to which there is potential to threaten the organization and potential for cooperation. Using a four-quadrant classification, they demonstrate when a stakeholder will take a defensive, collaborative, inclusive, or indifferent stance when interacting within the dyad. In assessing how stakeholders choose to interact with others, they must assess the capacity, opportunity, and willingness to threaten or cooperate (Savage et al., 1991). Power, size, control over resources, and the ability to form coalitions with other stakeholders are factors that drive decisions about how these relationships develop. Hunt and Morgan (1995) further underscore the importance of examining resource dependency between stakeholders as a critical facet of interaction choices.

In order for organizations to be competitive they must have a cooperative network of relationships comprised of partners such as suppliers, service people, customers, and investors (Solomon, 1992). Successful relationship building is advantageous because it lowers costs, improves quality outcomes and timely response to organizational needs. According to Morgan and Hunt (1994), organizational trust and commitment occur in an environment where there is communication, shared values, and significant incentives to persist in the relationship, or alternatively, high levels of termination costs. The model developed in Morgan and Hunt (1994) has had applications in many industries and study settings, including healthcare. In particular, the model of interorganizational trust and commitment has been adapted frequently to examine the physician–patient relationship (e.g., Platonova, Kennedy, & Shewchuk, 2008).

Examining the physician–insurer relationship from the physician practice perspective, Cote and Latham (2004, 2006) develop and test a model that describes elements present in the relationship and how they engage as stakeholders to form tangible outcomes. The model builds upon the theory presented in Morgan and Hunt (1994) where central in the relationship are trust and commitment. Table 1 provides descriptions of the antecedent, mediating, and outcome variables in their model. The relationship, consisting of formal and informal elements, is constructed through repeated interactions between insurers and physician practices. These interactions form the foundation for trust and commitment that lead to positive or negative financial and nonfinancial outcomes. The research examines

Table 1. Description of Stakeholder Relationship Quality Constructs
(Cote & Latham, 2004, 2006).

	Description
Antecedent variables	
Legal bonds	The extent to which formal agreements incorporate the expectations and obligations of the stakeholders.
Relationship termination costs	The expected losses from dissolution of the stakeholder relationship.
Relationship benefits	The measure of benefits from the stakeholder relationship relative to other options.
Shared values	The extent to which stakeholders have values in common concerning behaviors, goals, and policies.
Communication	The informal and formal sharing of information between stakeholders.
Opportunistic behavior	The extent to which stakeholders exhibit self-interested behavior without concern for the impact on the other stakeholder.
Mediating variables	
Relationship commitment	The belief that the ongoing relationship with the stakeholder is important enough as to merit extensive efforts to maintain it.
Relationship trust	The existence of confidence in the stakeholder's dependability and integrity
Outcome variables	
Acquiescence	The extent to which a stakeholder adheres to another stakeholder's request
Propensity to leave	The extent to which a stakeholder is likely to exit the relationship in the near future.
Cooperation	The extent to which stakeholders work together to achieve joint goals.
Financial impact	The direct and indirect effects of stakeholder engagement on revenues and expenses.
Functional conflict	The resolution of disputes in a harmonious manner.
Decision-making uncertainty	The perceptions of stakeholders concerning relevant and reliable information.

relationship quality from the perspective of the physician practice through the use of a structured survey. The following antecedent variables comprised of contracting and normative, tangible and intangible, are identified and supported: legal bonds, relationship termination costs, relationship benefits, shared values, and communication. These constructs represent the building blocks for commitment and trust between organizations (Zineldin & Jonsson, 2000). Attention to building the values inherent in the constructs leads to a trusting and committed relationship, which in turn leads to positive outcomes. The mediators, commitment and trust, affect six outcome variables: acquiescence, propensity to leave, cooperation, financial consequences, functional conflict, and decision-making uncertainty. Thus, when the physician practice makes the effort to build a relationship that

possesses trust and commitment, positive outcomes can be achieved both operationally and financially.

Obviously, both the physician practice and the insurer have responsibilities for this effort. Hence we need to understand how the insurance company approaches strategic physician practice engagement to achieve their organizational goals. We cannot assume that this unidirectional view is valid from the insurer's perspective. In fact, because there are substantial frictions in this industry it is highly likely that the physician's perspective is not aligned with the insurance companies' expectations for a high-functioning relationship. Therefore, a need exists to explore the physician–insurer relationship from the insurance company viewpoint. Whereas, the physician–patient relationship has been repeatedly explored and the physicians' view of the insurance relationship has been examined, a gap exists in our understanding of the stakeholder relationship network as viewed from the insurance company perspective.

With this theoretical foundation, we explore how insurance companies make choices that determine the types of physician practice relationships they create. We examine how insurance companies view relationship quality within the context of the stakeholder dyad forces facing the industry. Through this study, we expect to further our understanding of these issues, linking the relationship structure to profitability for both insurance companies and physician practices.

RESEARCH METHOD AND SAMPLE DESCRIPTION

Interview data collection and qualitative analysis methods were chosen to address the research question. As developed earlier, our goal is to assess the extent to which findings in prior research regarding the elements of relationship quality between the physician practice and insurance company, as measured from the physician practice vantage point, are reflected in the views expressed by the insurance companies. Elms, Berman, and Wicks (2002, p. 417) note "health care's contextual factors make the use of qualitative data particularly appealing." We adopt a multisetting case study approach which relies on comparative logic and extension (Eisenhardt, 1991, p. 622). Similar to Elms et al. (2002, pp. 416–417), we are not using qualitative data to generate new theory; rather, adopting deductive reasoning, we are using qualitative data to "evaluate and develop existing theory."

The subjects interviewed were members of one of three organizations: one physician practice and two insurance companies. The two insurance companies have a contractual relationship with the physician practice but do not have a relationship with each other. The physician practice is in a regional market where they have a dominant presence in relationship to other practices in the region. However, from a national industry perspective, the physician practice would be considered small to mid-sized, with 10 physicians and 3 regional offices. From this office two practice managers and one physician were interviewed. One insurance company was identified by the practice managers as a strategic partner. The number of patients covered by this insurer was 20% of the total non-Medicare patients in this practice, making them one of the larger insurers contracting with this practice. This insurer had no other physician practices in the region with which they had a greater percentage of patients. Two executives from this first insurer were interviewed separately for this study. By the same measure, the second insurance company is not a strategic partner for the physician practice. A total of six executives from two offices were subjects interviewed for this study. The contrast between the two insurance companies was expected to provide insights into differential relationship quality and emphasis. Over a 3-month period, we interviewed the eight executives at the two insurance companies; managerial participants were executive directors, district administrators, and medical directors. We conducted interviews of a physician and two office administrators at the study physician practice, both prior to and following the insurance company interviews.

There are 11 interviewees across the 3 organizations. While small in number, the purpose was to explore with each participant a deep probing of their perspectives. As prescribed by McCracken (1988, p. 17), "The purpose of the qualitative interview is not to disclose how many, and what kinds of people share this characteristic. It is to gain access to the cultural categories and assumptions according to which one culture construes the world. How many and what kinds of people hold these categories and assumptions is not, in fact, the compelling issue. It is the categories and assumptions, not those who hold them that matters. In other words, qualitative research does not survey the terrain, it mines it. It is, in other words, much more intensive than extensive. … For many research projects, eight respondents will be perfectly sufficient."

Because the goal is to gain a view from the other side of the dyad, constructs measured in Cote and Latham (2006) provided the foundation for the interview protocol. The interview protocol addresses the constructs defined in Table 1. Two insurance administrators in provider relations

independent of the two insurance companies used in the study reviewed the questions prior to the interviews and provided feedback. The process and methods received institutional review board approval. The pre-specification of the questions on each construct aided in establishing a nondirective stance; also, the interview guide was used to provide a structure that ensured completeness within the study frame of reference and minimize bias. As noted by Lillis (1999, p. 87), "such pre-conditioning reduces the tendency to resort to unplanned, non-neutral probes whilst in the field." The guide was created to be used flexibly with no requirement as to the order of the questions. The interviewees received the seven interview questions in advance of the interview. Table 2 contains the interview protocol. We interviewed the physician practice in advance of our insurance company interviews and returned to the physician practice with follow-up questions to obtain their perspectives on a few topics introduced by the insurance company but not addressed in our initial interview.

Following Miles and Huberman (1984), we created a list of codes from the conceptual framework and model variables. A professional transcriber produced our interview transcripts. The authors separately reviewed and double-coded the transcripts, establishing both intra- and intercode agreement. An analysis of those interviews linked to the model's constructs and to physician practice interviews follows.

RESULTS AND DISCUSSION

The central focus of our interview with participants is to explore how relationship quality and stakeholder theory are reflected in the insurer–physician alliance. We report the findings in the form of themes, which weave in the constructs presented in Table 1, that we identified across the interviews: patient care and relationship emphasis; impact of power and size; communication, values and opportunism; the patient versus the population business model; and, engagement outcomes. We conclude the discussion with a summary of the similarities and dissimilarities between the perspectives of the stakeholders.

Patient Care and Relationship Emphasis

The overwhelming response from interviewees is that their primary concern is for the patient; thus there exists a common purpose that serves as the

Table 2. Interview Guide.

Panel A: Background and questions provided to interviewees

Our research examines the links between healthcare provider–insurer relationship quality and performance outcomes. We have developed and tested a model with healthcare practices where we show how formal and informal constructs impact relationship trust and commitment with physician practices, when then positively impacts performance outcomes. We want to understand the issues you face in your relationships with physician practices. It appears you and your firm have taken a special interest in and worked toward actively managing these relationships. We believe we can learn a great deal from you. In return we believe we can provide some new insights about managing your relationship with physician practices.

1. What currently are the biggest challenges you have in the relationship with physician practices?
2. What are some factors or characteristics that make up a good relationship with a physician practice? A poor relationship?
3. What efforts do you take to manage the relationship with various physician practices? Over time, how have these relationships evolved?
4. What are the financial and nonfinancial implications of a good relationship? A poor relationship?
5. Please provide us with an example of a success in your relationship with a physician practice.
6. Please provide us with an example of frustration in your relationship with a physician practice.
7. Can you provide us with the name(s) of other individual(s) at insurance companies to whom we can ask these same questions?

Panel B: Interviewer Protocol

1. What currently are the biggest challenges you have in the relationship with physician practices?

Prompts (antecedents):
  Do you face ongoing contract issues (legal bonds)?
  Do you feel you share the same values? How are you able to discern the values of the other party in the relationship?
  How well do you communicate (provide examples, e.g., three-question rule)?
  Is there evidence in your mind of opportunistic behavior or self-interest without concern for impact on other members of relationship?
  Is this relationship costly in your mind (e.g., demands on time, claim processing, monitoring, credentialing)?
  Are there revenue issues (e.g., reimbursement)?

2. What are some factors or characteristics that make up a good relationship with a physician practice? A poor relationship?

  Prompts: (This ties into #1 above. For example, if they have identified a breakdown in communication as the biggest challenge, we can prompt if good communication is a characteristic that makes up a good relationship).

3. What efforts do you take to manage the relationships with various physician practices? Over time, how have these relationships evolved?

Prompts: If they have highlighted factors above as important, do they spend time on these factors?
  Specifically,
  Contract?
  Communication?
  Values?
  If they face opportunistic behavior, over time what do they do?
  If costs increase or revenue decreases, over time what do they do?
  How much control do they have over the various antecedents?

Table 2. (*Continued*)

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4. What are the financial and nonfinancial implications of a good relationship? A poor relationship?
Prompts (outcomes):

> Do you see a positive financial impact of a good relationship (negative = poor)?
> Do you feel there are times when it is important to acquiesce for the good of the relationship (in a good relationship versus a poor)?
> How easy is it for you to leave various physician practice relationships? Would you make a stronger effort to leave a poor-quality relationship, or stay with a high-quality relationship?
> Are you more willing to cooperate in a high-quality relationship?
> Do you feel there are times functional conflict is appropriate? Would this be more appropriate in a good relationship versus a poor-quality relationship?
> Do you face less uncertainty in decision-making in a good relationship versus a poor relationship?

5. Please provide us with an example of a success in your relationship with a physician practice.

6. Please provide us with an example of frustration in your relationship with a physician practice.

7. Can you provide us with the name(s) of other individual(s) at insurance companies to whom we can ask these same questions?

Note: Most will offer someone who agrees with them. Ask for someone who sees the world differently than they do or someone who has had different experiences than themselves. Ask why this person is different from them and why they might have this different perspective.

foundation for the relationship. In general terms, interviewees express their beliefs that a high-quality physician–insurer relationship is crucial to ensure patient care. With the exception of one participant, the insurance executives interviewed also emphasized that the product is the relationship with the physician practices; that nothing else can be accomplished without attending to building a quality relationship. The following insurance executive's statements exemplify the centrality of relationship quality:

> We don't take relationships for granted. That we are visible and helpful and trying to make things – trying to listen to them and get their input and their concerns, try to bring clarity to what we're delivering and in the context of their practices, not in the context of the insurance company. So it is just that – you know, we're in a relationship business, really. Our value is the relationship part. (Anonymous 1, personal communication, pp. 6–7, March 15, 2005)

There is further recognition that in order for the relationship to possess quality, trust and commitment must exist at the core of engagements. For instance, one insurance manager revealed that their first step is to identify partners who are interested in a 5–10 year relationship. A committed relationship will have characteristics that differ sharply from a transactional-based relationship. A transactional-based relationship will view each

interaction as an independent event, with the goal for each participant to maximize the benefits they can capture. However, in a committed relationship, each interaction is but one part of an ongoing association where give and take can occur because each participant knows that over time the benefits will accrue. This takes the focus off the immediate event and placing it in context of history and relationship building.

Stakeholder theory is organized around two central questions: the purpose of the firm and the relationship quality (Freeman, 1994; Freeman et al., 2004). At a basic level, both stakeholder groups have a common purpose as their organizing framework. Each professes that the end goal is patient care and that a high-functioning relationship between physician practice and insurer is an essential element in the process toward the end goal. However, even though these fundamental components are present, how each stakeholder group conceptualizes the process may differ. We now turn to the relationship quality question posed by stakeholder theory and empirically tested through relationship quality models (e.g., Morgan & Hunt, 1994; Cote & Latham, 2006; Berry et al., 2008).

Strategic versus Nonstrategic Relationships: Impact of Power and Size

The research design led to choosing one insurance company that was a strategic partner for the physician practice and one that was nonstrategic. This designed opened the conversations with the interviewees to constructs that were not in the Cote and Latham (2006) relationship model. Specifically, what emerged from the interviews were the views that relative power and size between the stakeholders were instrumental factors in how insurers chose to develop relationships with individual physician practices.

Physician practices suggest several tangible constructs lead to this increased commitment to a partnership with an insurer. Prior research found that clear legal agreements which incorporate the expectations and obligations of partners, identifiable partnership benefits and significant switching costs, such as the cost of finding a replacement relationship, support commitment to an alliance with an insurance company (Cote & Latham, 2006). In the current study, we observe similar perceptions by insurance company management, with one insurer noting "right now we have more people negotiating contracts than there used to be in the past" (Anonymous 2, personal communication, p. 8, June 6, 2005). However, through the interview process, we identify an underlying emphasis on the strategic partner's power and influence as determined by its size compared to other partners. Savage et al. (1991, p. 63)

note, "the more dependent the organization, the more powerful the stakeholder." To the extent that one stakeholder controls the resources the other depends on, the greater the influence on contract content and the ability to enhance or diminish benefits. It also becomes more challenging to switch to a new partnership. The following insurance executive's comment provides insight into contract negotiations with a physician practice they consider a primary strategic partner:

> That is a given in negotiation. In other words, when we sit down with (Physician practice name), they know that we know they bring more value. So the starting point and typically the duration of the negotiation is shorter because we're not – we're not likely to go out and press them hard. We know what the market is paying. And so we're going to be there, if not a little bit higher (however) we've got leverage with them as well. (Anonymous 1, personal communication, p. 21, March 15, 2005)

From the physician practice perspective, one of the office administrators also supports this assessment concerning strategic versus nonstrategic partnerships in reference to the two insurance companies interviewed:

> (Insurance Company name) is (one of) ... our ... highest billings. We are one of (Insurance Company name)'s major clinics in this area. This is definitely evident in our contract negotiations with them. They are definitely willing to negotiate and work with us. I think if we did not renew a contract with them it would have a big impact on their enrollment... (Insurance Company name) is about (small percentage) of our billings. I do not think we are as big of a player to them. They are not as willing to negotiate contracts. (Anonymous 5, personal communication, p. 1, June 26, 2005)

With a strategic partner, there are cost benefits as well as costs to switching partnerships, both strengthening the perceived value of committing to the relationship. As one insurance executive said:

> When we have new products coming out, they are the first folks we go to, to bounce ideas off of...So they are kind of our think tank, physicians' think tank. We also rely on (Physician practice name) to do almost all of our specialty care. (Anonymous 1, personal communication, pp. 8–9, March 15, 2005)

Interviewees from both insurance companies reflected on differences in the level of relationship management knowledge concerning agreements, costs and benefits between large and small physician practices, as well as the impact of limited resources on those smaller practices. As one executive noted, "there is a bit of a disconnect there when they don't understand the business side of what goes on behind this ... or they don't have the tools and time to deal with it" (Anonymous 3, personal communication, p. 17, June 6, 2005). Another insurance executive discussed how little influence a

nonstrategic or smaller player has on the tangible antecedents, such as the contract:

> The office person may or may not be real up to speed on whether they are even getting paid from us or not. They certainly sometimes don't know what the contract rate is … . None of them have called us and said "Geez, the market is at $49 and you are paying us $43." So I mean there are some providers who just don't know what they're getting paid. (Anonymous 1, personal communication, p. 15, March 5, 2005)

Both large and small physician practices face significant business practice diversity between different insurers, even with considerable state law regulations (Cote & Latham, 2003). One insurance company manager even notes the need for "a common medical policy amongst all the insurance companies … (that there) shouldn't be … all these different medical policies (that are) quite destructive" (Anonymous 3, personal communication, p. 13, June 6, 2005). The burden of navigating the dissimilarities appears to impact the smaller practices the most and negatively impacts important intangibles within the relationship.

Communication, Values, and Opportunism

Physician practices note that several intangible constructs, for example, common values, appropriate communication, and a lack of opportunistic behavior (perceived or real) are crucial, yet often ignored or misused aspects of the alliance relationship (Cote & Latham, 2006). Savage et al. (1991) suggest the organization makes two critical assessments concerning its stakeholders when evaluating the external, internal, and interface environment surrounding their interactions: the potential for the stakeholder to threaten the organization, and the potential for the stakeholder to cooperate with the organization. Shared values, defined by Morgan and Hunt (1994, p. 25) as "the extent to which partners have beliefs in common about what behaviors, goals, and policies are important or unimportant, appropriate or inappropriate, and right or wrong," are shown to be key antecedents to both relationship commitment and trust. As noted by one insurance executive, "They have their vision of patient care, we've got ours, and those don't match, so sorry [relationship breakup]" (Anonymous 1, personal communication, p. 24, March 15, 2005).

The survey and interview of physician practices also indicate relationships often break down or endure substantial friction due to mismatched values (Cote & Latham, 2006). It is important to clarify that this friction results

from a lack of alignment in behavior and policy expectations, rather than a difference in goals. Each partner's business model provides a process to reach that goal, which translates into misaligned expectations, which in turn undermines a positive assessment of cooperation (Savage et al., 1991). The following comment from one insurance executive illustrates the critical role understanding expectations plays for both sides:

> We're … talking about … those physician practices that have a contractual relationship with us where we have common interests involved. And I think it starts out with understanding what the expectations are from both sides. What's expected of them in order to have a successful relationship and what it is that we're supposed to be doing in order to have that successful relationship. (Anonymous 4, personal communication, p. 3, June 6, 2005)

Expectations at different levels within the organization, as well as separation of the expectation from the execution, also causes friction. One interviewed insurance executive presents such a scenario:

> The all important relationship is there was an expectation for services rendered coming into this company, that there is going be a reasonable reimbursement back in a reasonable period of time. And that's the crux. I think where you have a mismatch of perception is that there may be parties within the organization who clearly understand how that works, and there may be other folks who are responsible for actually doing claims submission or claims posting that really don't understand what it is that they're doing or what it is that they could do better in order to facilitate that process. So you have got somebody in a key management position who has a certain set of expectations. The bottom line is they don't see those expectations coming on reimbursement and payment. And the first thing is that the insurance company is not doing what they are supposed to be doing. So if anything along that way doesn't happen that's where you have got to realign to figure out what it is. And you have to have people open and willing to say "Oh, I understand that." (Anonymous 4, personal communication, pp. 4–5, June 6, 2005)

Personnel in the physician practice are faced with a different claims process for each insurance company. Personnel in the insurance company are confronted with varying degrees of knowledge and understanding from the personnel in the physician practice regarding claims submission and posting. Each set of individuals are attempting different forms of communication and modes of interaction.

Communication, as we are using the term, is the formal and informal sharing of "meaningful and timely information between firms" (Anderson & Narus, 1990, p. 44). It is the bond that holds a relationship together (Mohr & Nevin, 1990). The differences in communication styles between the partners may also be influenced by how well both stakeholders' employees are educated about business policies, procedures and processes, and

differences in the types of technology used by the insurance company and the physician practice. Both partners are making an effort to find common ground among the labyrinth of reimbursement and claims processing, or as stated by one insurance executive, "we shouldn't be adversaries…we're trying to help people" (Anonymous 3, personal communication, p. 30, June 6, 2005). This executive goes on to say:

> I can tell you for sure in talking to the doctors, if you go to them and say we're not going to pay for what you want for your patient, because we down at headquarters decided it is medically unnecessary, they will go nuts. They will go through the roof. But if you say, you know, we're not going to pay for what your patient wants because their employer chose not to insure against it or because the literature here, you know, these 55 papers don't support it or there is insufficient literature, they will understand that. So there are two different approaches here. (Anonymous 3, personal communication, p. 43, June 6, 2005)

Another insurance executive stated that promoting dialog through volunteer groups of frontline individuals "to hear what those headaches are and really build action plans for resolution" and adding a physician ombudsmen are relatively new avenues being used that "ten years ago in any insurance company it (didn't) happen" (Anonymous 2, personal communication, p. 8, June 6, 2005).

Similarly, the physician practice, faced with an ongoing contracting problem with one of the two insurance entities they work with, used a cross-sectional group of insurance personnel to reach consensus. This physician practice executive goes on to explain:

> We stressed that this was a relationship that really needed to work for both sides and tried to figure out how to make that happen. We stated, "this is where we are and this is how other insurance companies work with us. Can you work with us in a similar way?" We discussed how we comply by developing forms and follow-up to be sure the physicians fill the forms out appropriately which reduces monitoring for them. (Anonymous 5, personal communication, p. 1, February 24, 2005)

Both insurance companies further note increased interaction with the dual purpose of education, termed "eliminat[ing] the black box" (Anonymous 2, personal communication, p. 12, June 6, 2005) or "allowing us to be in their shop educating them" (Anonymous 2, personal communication, p. 17, June 6, 2005) regarding processes, as well as monitoring practice statistics. In addition, emphasizing technological advances increases connectivity between partners. From the insurer's perspective, they are "putting the time in to be more proactive rather than being reactive" with technology (Anonymous 4, personal communication, p. 11, June 6, 2005).

> There is a need for constant communication and constant information. The deployment of a significant amount of staff time that actually goes out to the offices and works with those staffs, educational seminars that we hold in order for them to make sure that they understand what it is that they need in order to have that fixed. (Anonymous 4, personal communication, p. 6, June 6, 2005)

Another insurance executive describes how their company tries to improve communication with the physician practice:

> Well, there is a standing meeting once a month. There are actually several standing meetings once a month, but practically, probably every other day…I mean there are lots of levels of communication, whether it is doctor to doctor, some of it is administrator to administrator. Sometimes it's a mix of both. So it is really a virtual organization in a lot of ways. (Anonymous 1, personal communication, p. 12, March 15, 2005)

It should be noted that this investment is typically made for the strategic partner, whereas communication with the nonstrategic partner "tend[s] to be more transactional based" (Anonymous 1, personal communication, p. 14, March 15, 2005). With the increased emphasis on developing technology, the communication gap is widening for some physician practices and, as an insurance executive commented, "there are…a large percentage of small practices who have limited connectivity" (Anonymous 4, personal communication, p. 16, June 6, 2005).

Communication has a bimodal relationship with trust, that is, there can be both too much and too little interaction (Cote & Latham, 2006). A physician interviewed for the current study provides support for these observations by stressing he spends approximately 15–45 min a day corresponding with one of the two insurance companies, which he complained interfered with his work. Foster and Jonker (2005) note there are two forms of communication in stakeholder engagements. Some organizations view the engagement as a type of control and manipulate the engagement to serve their own needs best. Others look at it as a two-way relationship that takes into consideration the other party's interests and concerns. However, when insurance companies monitor individual physicians and their practice statistics, the physicians often view the monitoring as self-interested on the part of the insurer, creating an adversarial context rather than one that is supportive.

Evidence of opportunistic behavior, or "self-interest seeking with guile" (Williamson, 1975, p. 6), can also be a problem in long-term relationships. This behavior can negatively affect trust in future interactions, escalating the view that the stakeholder has the potential to threaten the organization (Savage et al., 1991). A growing battle between physician practices and

insurers over specialty services illustrates such a scenario. As one insurance executive stated:

> We have stormy relationships with some specialists who like have monopolies in town. We have monopolies in certain specialties now where they try to just tell us what they are going to do … . It has really gotten more significant in the last three to five years as physicians have added a lot of services in their offices that were once considered to be hospital services, like MRI and infusion services and those things. I mean we've had a proliferation of surgery centers and those things. We almost always have tense discussions around adding new services that take funds out of our community hospitals. Because the doctors will cherry-pick – in other words, they will see the people who have insurance and all of that, and then the hospitals get the rest. (Anonymous 1, personal communication, p. 25, March 15, 2005)

When opportunistic behavior is present, alliance members can no longer trust each other, leading to decreased relationship commitment and the likelihood of friction in future interactions. Stated alternatively, when a stakeholder is seen as having a low potential for cooperation and a high potential for threat in an interorganizational relationship, the resulting strategy is to become defensive against the nonsupportive stakeholder (Savage et al., 1991).

The Patient versus Population Business Model

With a common basic purpose, we again find that the road to that purpose is viewed differently for insurers versus physician practices. One fundamental difference that emerged from the interviews is a conflicting world view regarding the delivery of patient care. The physician practice focuses on the individual patient's needs for immediate treatment; the insurer focuses on how that patient fits within the population of individuals who have a particular ailment or treatment need. The insurer works within a model of trends and statistics. Recall the insurance executive who noted: "they have their vision of patient care, we've got ours, and those don't match, so sorry [relationship breakup]" (Anonymous 1, personal communication, p. 24, March 15, 2005). It is these divergent views on the model of healthcare delivery that are primary sources of friction within the relationship. It is an undercurrent that is pervasive and drives the interactions resulting in the engagement outcomes detailed in the next section.

Engagement Outcomes

Attention to building a trusting and committed stakeholder relationship, leads to positive outcomes. One of these outcomes is appropriate compromise or acquiescence (Morgan & Hunt, 1994). Acquiescence in a committed relationship can lead to further trust as indicated by the comments of one insurance executive:

> They read the contract, and they say, well, this is what I wanted to change in the contract. And we say well, this would mean to you and to us, and then we finally compromise and we do it. (Anonymous 2, personal communication, pp. 8–9, June 6, 2005)

In another scenario, the insurer wanted to eliminate a physician practice's use of a brand name drug, substituting a generic drug. According to a physician practice executive, to entice the physician practice, the insurer offered to give the practice the generic drug so that the physicians did not have to prescribe the medication, but could give the generic drug, at no charge, to their patients. The physician practice argued it was inequitable to their patients who were not part of this insurer's plan; that is, they could not give free medications to certain patients just because they were this insurance company's clients. The insurer compromised and said the physician practice could give the generic drug at no cost to all of its patients. Both parties in the negotiations were able to work through their differences in patient versus population viewpoints and the possible appearance of insurer opportunistic behavior because they had a positive, committed relationship.

Most managers acknowledge differential financial impacts among their third-party interactions and there exists strategic efforts to structure conditions to enhance the financial benefits (Morton, 2002). Hence, the degree of relationship quality can have direct and indirect effects on revenues and expenses. Our study reveals evidence of negative and positive financial implications. For both parties, costs can exceed benefits, resulting in relationship termination, as this insurance manager indicated:

> … that a physician finds it too much hassle to do whatever is asked when working with us, and we will say well, we have three investigators working on one claim of yours and we really cannot afford that to happen … we would like to work with that provider as much as we can, but if (the approaches) all fail, you know, it is probably good to walk away from this relationship. (Anonymous 2, personal communication, pp. 36–37, June 6, 2005)

Note that the physician practice is concerned with resolving issues claim by claim, whereas the insurer is concerned that too many of their resources are going into resolving *one* claim. The insurer may believe it has been clear

in communicating what is covered through the contract, through frequent interaction and emphasis on where the physician practice falls in terms of trends (e.g., the practice's patients may have more of an insurance coverage need than average). The physician is not focusing on trends within populations of patients, rather on the treatment of one individual who is seeking care in his/her office. In this circumstance, the underlying difference in business models creates an impasse.

Alternatively, in a relationship where trust and commitment exist and the difference in business models does not counteract the antecedent effects, there can be real financial benefits to both parties. For example, one insurer assumes the cost of software that allows a practice to connect electronically with them. The provider benefits with the elimination of paper and postage costs as well as more rapid claims processing. As this insurance executive noted, "… their A/R days are going dramatically down. They've got a cash flow" (Anonymous 4, personal communication, p. 19, June 6, 2005). Another online service allows access to member eligibility records and provides claims history to minimize questions about when the claim is to be paid. This insurer also provides the ability to submit referrals online and for the physician practice to view referral approvals. The insurance executive notes "that we reduce a lot of our regular telephone calls that come in, because they don't have to call us to check eligibility and benefits…" (Anonymous 4, personal communication, pp. 20–21, June 6, 2005).

Alliance partners exhibiting higher relationship quality spoke of an atmosphere of cooperation with enhanced communication and the increased use of online computer technology. Conflicts and disagreements that occur are resolved more amicably, as the above insurance executive indicates, "Because in the end result they do a better job, we do a better job, and we have less hassle between the organizations. And the discussion is much more intelligent between the two parties" (Anonymous 4, personal communication, p. 10, June 6, 2005).

The reason for success in high-quality relationships is not exclusively due to the tools each party employs. A common understanding between both stakeholders, that transactions are viewed from different business lens, is critical. The air of cooperation stems from carefully developed agreements, over many interactions, yielding greater understanding between each partner. The successful stakeholder engagement incorporates critical, timely feedback that has not been explicit in prior models of relationship quality (Cote & Latham, 2004, 2006; Morgan & Hunt, 1994). The feedback works to eliminate uncertainty in future interactions, for example, by providing inter-office education, using standardized rules, and diminishing the amount

of fluctuation regarding patient versus population disagreements. One insurer executive, states that in terms of relationship management, "We try for no surprises" (Anonymous 4, personal communication, p. 42, June 6, 2005).

SUMMARY AND IMPLICATIONS

Our study's results underscore the importance of examining both sides of stakeholder engagement. We found perspectives that both confirmed and contradicted the views of physicians. Through this investigation of the insurance company viewpoint, we have added clarity to the sources of this dyad's relationship frictions. Specifically, we have identified two major themes, the difference between strategic versus nonstrategic alliances and differing views regarding the focus of patient care, that is, individual versus population views. We furthermore confirm that relationship constructs found in Cote and Latham (2006) are also important from the insurer's perspective, such as communication, legal bonds, and opportunistic behavior. Financial performance as it relates to relationship quality was further clarified. From the insurers' perspective, they find that they must develop relationships with scores of physician practices and devote time to understanding their individual idiosyncrasies. For those practices that are sophisticated and strategic, the investment has a positive return. However, for many that do not fit this description, there is a lack of trust in the practice's ability to conduct sound business practices, which leads to the insurer needing to devote resources toward verifying and educating the physician practice management. As most of these are nonstrategic alliances, the cost to the insurer is high.

We find common agreement that the core values and purpose are for quality patient care. However, we find differences in the processes by which patient care is delivered. There is often a lack of expectation alignment. Friction develops when expectations at different levels within the organization, as well as separation of the expectation from the execution, occur. However, both sides of the partnership speak of increased efforts to align expectations and being proactive rather than reactive. A timely relationship management feedback mechanism, which creates understanding related to each others' business models, is crucial in successful alliances. Fig. 1 illustrates the interactions impacting relationship quality for both sides of the partnership.

Given their different business models, each side approaches relationship-building activities differently. An insurance company may emphasize invest
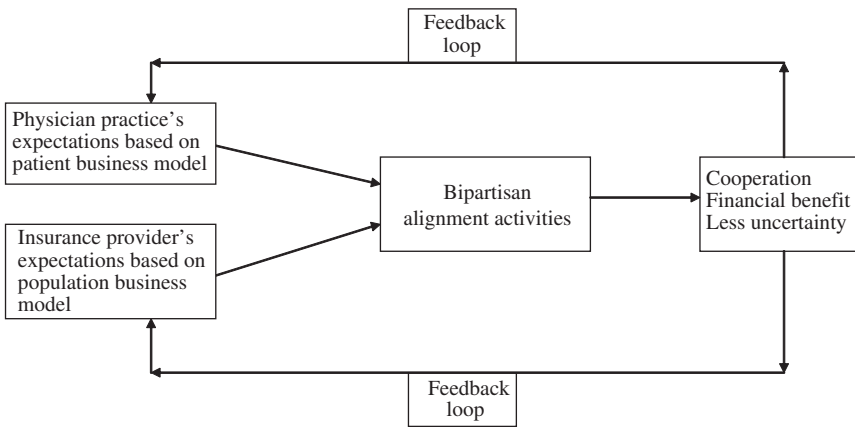
Fig. 1. Expectations and Alignment Activities in Stakeholder Engagements.

time and resources into contract specification, relationship management people, an interactive website, educational workshops, new technology and an increasing emphasis on streamlining business procedures and practices. Conversely, the physician practice managers focus on clarity of expectations at each interaction stage at the patient level and then attempts to train its employees, including physicians, to comply with the process. Physician culture also presents a barrier to effective communication. Physicians expect autonomy and resist insurance company intervention on patient care issues. As one physician noted about his colleagues, they ''want to do things the way they have always been done. If there is science to back up a change in things, they will change, but organizationally, they are rigid'' (Anonymous 6, personal communication, p. 1, March 16, 2005). While this physician was concerned about his colleagues inflexibility, he also expressed frustration with the methods insurers use to gain physician cooperation. He states, ''They send papers that no one reads. They have meetings to explain insurance company processes in XXX and pay doctors $200 for two hours and three people show up'' (Anonymous 6, personal communication, p. 42, June 16, 2005).

It is critical to understand what works and what does not work in any stakeholder engagement. It is not a one-size-fits-all solution in working with each individual stakeholder. Our findings make clear that achieving a tight set of shared values between partners will be challenging and it is critical that both parties build on their areas of agreement. Fostering shared

views on patient education, preventive care, technology-based solutions, and building upon those to close the values gap will enhance communication and trust between stakeholders.

While we have focused a single dyad in the healthcare delivery chain, we recognize that key stakeholders, employers, and patients have been omitted from this discussion. Future research may examine the complexity that exists when all direct stakeholder relationships are included. Termed stakeholder multiplicity (Neville & Menguc, 2006), mapping the relationship web will provide additional insight into the frictions within the healthcare value chain.

The healthcare industry offers a rich palate of discovery to learn how interorganizational relationships impact performance. With the current stakeholder frictions, governmental and political interventions, and high stakes outcomes, the industry offers substantial opportunities to explore what works well and what is dysfunctional. By examining the circumstances surrounding an industry with high stakeholder complexity and friction, we gain insights we can translate into other interorganizational stakeholder situations, which are more nuanced. By testing how findings in the healthcare industry are consistent with other industries, the boundaries of theory can be drawn. Ultimately, the aim is to provide managers a clear path that leads from relationship building to the income statement. This work in the healthcare industry is a step in that direction.

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MANAGEMENT CONTROL AND WEB-BASED CORPORATE REPORTING: AN EMPIRICAL EXPLORATORY STUDY

Sylvie Héroux and Jean-François Henri

ABSTRACT

While the idea of control packages goes back to the early 1980s, empirical management accounting researchers have been reluctant to examine this broader view of management control. Past research has addressed the use of management control for the organization as a whole, as well as for specific objects of control. While those objects of control typically involve information available for internal uses, we do not know much about the role of management control when the object of control is comprised of information intended to be disclosed outside the organization. This study aims to examine the role of a control package to manage web-based corporate reporting. More specifically, this study aims to examine the antecedents and consequences of a management control package related to web site content. The results suggest that perceived environmental uncertainty and stakeholder orientation are key factors that influence the extent of use of the management control package. Moreover, the extent of use of a management control package is associated with the quality of web site content but not the quantity of information disclosed.

INTRODUCTION

The conceptualization of management control varies from a restrictive view referring to traditional feedback and cybernetic process to a broader view encompassing almost everything managers do to acquire, deploy, and manage resources (Merchant & Otley, 2007). The idea of "management control operating as a package" falls within these two extreme views. Management control package is defined as a collection or set of controls and control systems that are used by managers to ensure that the behaviors and decisions of their employees are consistent with the objectives and strategies of the organization (Malmi & Brown, 2008). While the idea of control package goes back to the early work of Otley (1980), much of the management accounting research has focused on the accounting-based controls such as budgeting, performance measurement and incentives, and has neglected other forms of control (Malmi & Brown, 2008).

Management control has been studied for the organization as a whole (e.g., Simons, 1990; Ahrens & Chapman, 2004; Chenhall & Euske, 2007), as well as for specific objects of control such as human resources management (Widener, 2004; Davila, 2005), product development (Davila, 2000; Bisbe & Otley, 2004), lean manufacturing (Kennedy & Widener, 2008; Fullerton & McWatters, 2002), environmental management (Epstein & Wisner, 2005; Henri & Journeault, 2009, in press), and ERP (e.g., Chapman & Kihn, 2009; Chapman, 2005). While those objects of control typically involve information available mostly for internal use, we do not know much about the role of management control when the object of control is comprised of information disclosed outside the organization. Considering the risks associated with external disclosure (e.g., lawsuit if information is wrong, providing strategic information to competitors), the use of a set of controls becomes even more important.

This study aims to examine the role of a control package to manage web-based corporate reporting.[1] This refers to financial and nonfinancial information disclosed to different groups of stakeholders (hereafter the Web site content). Besides the risks related to external disclosure, this object of control is of interest to management accounting researchers and practitioners for various reasons. First, an organization has to maintain a dialogue with stakeholder groups that are identified as strategically important to assure its survival. The Internet can help to maintain a dialogue with stakeholders (Unerman & Bennett, 2004). By maintaining good relations with stakeholders, facilitating their access to information and considering their information needs, organizations can benefit from

economic advantages such as increasing sales and reducing costs (Krumwiede, Swain, & Stocks, 2003), especially information dissemination costs (Ashbaugh, Johnstone, & Warfield, 1999; Beattie & Pratt, 2003).

Moreover, accounting standard-setters and regulators encourage firms to adopt an Internet disclosure policy (IFAC, 2002; TSX, 2003). Since this policy reflects managerial intentions, there is a need to put in place a set of controls to make sure the policy is applied. Furthermore, much attention has been devoted to web site content itself as prior research in accounting had mainly (i) examined some aspects of web site content (e.g., type, form, and timing of information), (ii) identified potential content determinants (e.g., organization size, business sector, financial performance, indebtedness, ownership structure) (e.g., Pirchegger & Wagenhofer, 1999; Debreceny, Gray, & Rahman, 2002; Oyelere, Laswad, & Fisher, 2003; Marston & Polei, 2004; Xiao, Yang, & Chow, 2004), and (iii) proposed a disclosure-management model adapted to the Internet context (Trabelsi, Labelle, & Laurin, 2004, based on Gibbins, Richardson, & Waterhouse, 1990, 1992). However, we do not know much about the control of web site content. For instance, some aspects have been addressed in past studies: (i) incorporation of the online communication strategy into the overall communication strategy (Lybaert, 2002); (ii) involvement of external auditors in the web-based reporting process (Fisher, Oyelere, & Laswad, 2004); (iii) time required to put information online (Ettredge, Richardson, & Scholz, 2002b); and (iv) controls required to purge web site content and to ensure that hyperlinks are functional when new content is added (Ettredge & Gerdes, 2005). While those studies are informative, their number is limited. Consequently, the findings about the control of web site content remain fragmentary and numerous topics remain unexplored.

Based on a survey and on the web site analysis involving 180 Canadian organizations, this paper specifically aims to explore four research questions: (i) To what extent management controls are used to support web site content? (ii) To what extent these controls constitute a control package operating as an interrelated whole? (iii) To what extent various sources of pressure influence the deployment of the management control package? (iv) To what extent the management control package supports the maintenance and improvement of web site content in terms of quantity and quality?

In the next section, a conceptual framework is developed. Thereafter, the data collection procedures, the sample, and the measures are described. Results are presented, followed by the discussion and conclusion.

CONCEPTUAL FRAMEWORK

Overview of the Model

Fig. 1 presents the overall model that illustrates the relationships among two sources of pressure (perceived environmental uncertainty (PEU) and stakeholder orientation), the management control package related to web site content (decentralization, standardization, planning, monitoring), as well as web site content (quantity and quality). In order to provide support for the development of the conceptual framework and the selection of variables, and to guide the data collection, management accounting, corporate reporting, and web-based reporting literature was reviewed. Consulting interviews were also conducted.[2]

PEU may be defined by three characteristics: (i) environmental dynamism refers to the unpredictability of competitors' actions, client demand, and regulation (Miles & Snow, 2003 [1978]); (ii) environmental hostility is characterized by competition for product/service prices and by regulation intensity (Gordon & Narayanan, 1984; Miller & Friesen, 1984);
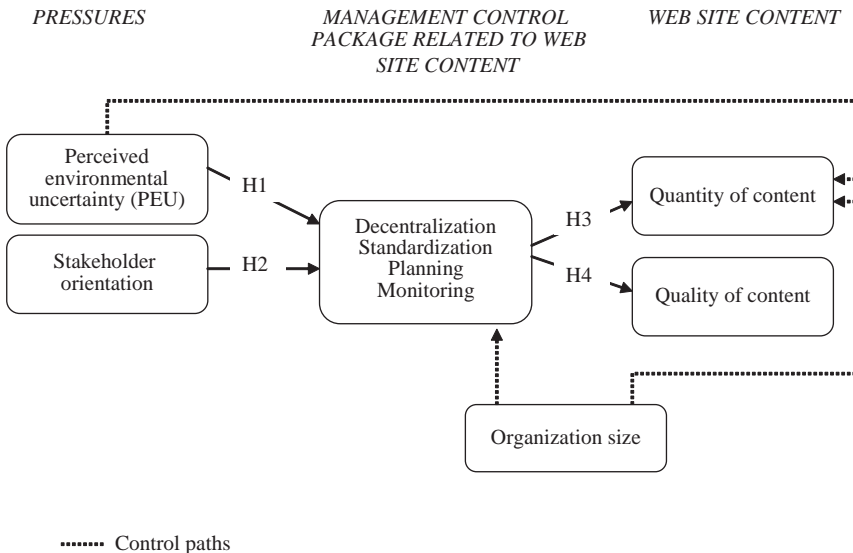
Fig. 1.   Conceptual Model.

and (iii) environmental heterogeneity is defined by the diversity of competitive tactics and client tastes (Miller & Friesen, 1984). A firm's stakeholder orientation can be defined by the overall attention paid to different groups interested in the organization's business, as reflected in its corporate mission or vision (Greenley & Foxall, 1997; Waterhouse & Svendsen, 1998).

PEU and stakeholder orientation were selected as sources of pressure that could influence the management control package related to web site content for the following reasons. First, management control is designed to help an organization adapt to its *environment* and to deliver the key results desired by *stakeholder groups* (Merchant & Otley, 2007). Thus, PEU and stakeholder orientation represent two basic drivers of control systems. Second, those two variables represent key factors in the web-based corporate reporting literature: perceived uncertainty can influence management's choice of reporting (Thomas, 1986) while stakeholders' information needs are taken into consideration in the web-based communication strategy adopted by a firm (Gowthorpe & Flynn, 2002; Gowthorpe, 2005).

Management control package is conceptualized in two ways. First, it is conceptualized at a specific rather than at a general level. We focus on management controls specifically related to web site content. Second, the management control package is comprised of four important and interrelated controls in a context of web-based reporting, namely (i) decentralization of responsibilities to involve different groups in the process of writing and delivering the information content, (ii) standardization of practices to bring consistency to this process, (iii) the long range and action planning of this process, as well as the (iv) monitoring of the web site content. More specifically, decentralization refers to the degree of involvement of various groups in writing the content and delivering it online, as well as in improving the site. Standardization is defined as the formal and informal procedures, including clear roles and responsibilities, which are used to bring consistency to the content control process. Planning involves the decisions and actions needed to ensure that web site objectives are consistent with the company's overall communication strategy and the long-term anticipation of stakeholder communication needs (long-range planning). It also refers to the identification of web communication-related risks as well as the resources required to maintain and improve the site (action planning). Monitoring is defined as the assessment of web site content in order to identify content to be withdrawn, added, or improved.

Mainly based on previous Internet reporting studies (e.g., Xiao et al., 2004; Marston & Polei, 2004), web site content is first described as the quantity of

information disclosed on the sites. However, providing more information is not necessarily better. Consequently, we also consider another aspect of the Web site content, namely the quality of this information. Hence, web site content is defined as the quantity and quality of information. The quantity refers to the number of items disclosed on the site (among others, Debreceny et al., 2002; Ettredge, Richardson, & Scholz, 2002a; Héroux & Cormier, 2002; Marston & Polei, 2004; Pirchegger & Wagenhofer, 1999; Xiao et al., 2004). According to consulting interviews (Footnote 2), the quality can be assessed in terms of the type, format, and user-friendliness of content, in comparison to the leading competitors' web sites.

Overall, PEU and stakeholder orientation are expected to be positively associated with the management controls related to web site content (Hypotheses 1 and 2). Furthermore, a positive association is expected between the management controls and web site content (Hypotheses 3 and 4). Considering the results of past studies, we also control for the links (i) between PEU and the quantity of web site content and (ii) between organization size and management controls as well as the quantity of web site content (control paths, dotted lines in Fig. 1). Lastly, it should be noted that we take into consideration the potential correlation between each exogenous factor in the model (not illustrated in Fig. 1). Indeed, we have added three correlation parameters to the model (i.e., PEU-stakeholder orientation; PEU-organization size; stakeholder orientation-organization size).

PEU and Stakeholder Orientation as Sources of Pressure on the Management Control Package

PEU

Organizations adapt their management control to the environment (Chenhall, 2003). More specifically, the PEU affects various management control mechanisms (Chapman, 1997; Chenhall & Morris, 1986; Chong & Chong, 1997; Ewusi-Mensah, 1981; Gordon & Narayanan, 1984; Khandwalla, 1972). As previously stated, disclosing information online can help a firm to maintain a dialogue with stakeholders. Firms perceiving a greater environmental uncertainty can therefore use more elaborate management controls related to their web site content for different reasons. When the environment is perceived to be more uncertain, organizations can use their web site to keep stakeholders more informed about changes in financial condition, products/services offered, or prices. Firms need to be more flexible to make sure that stakeholders' online unpredictable

information requests are dealt with effectively and efficiently. To stay or be more competitive and to encourage electronic transactions, organizations have to anticipate stakeholders' information needs. When using their web site to reach different stakeholder groups, firms have to manage risks. In this respect, the information disclosed on a web site could be relevant to those groups because it is released quickly. However, its integrity or reliability/ credibility might be compromised, and incorrect information could therefore expose firms to lawsuits. Moreover, they have to be careful about disclosing too much information about strategic issues. Therefore, it becomes important for a firm to use a management control package comprising integration of web-based reporting into the overall communication strategy, constant review and frequent updating of web site content, efficient involvement of various groups with different expertise (e.g., finance, marketing, technology), clarification of roles and responsibilities, and development of procedures. These arguments lead to the first hypothesis.

H1. There is a positive association between PEU and the extent of use of a management control package related to web site content.

Stakeholder Orientation

A multiple stakeholder oriented firm pays attention to more than one group of stakeholders (Greenley & Foxall, 1997). Managing from a multiple stakeholder perspective (as opposed to a single stakeholder one such as a shareholder perspective) requires paying attention to different groups' potentially conflicting interests (Donaldson & Preston, 1995). In accordance with their overall stakeholder orientation, organizations may use management controls to deal with stakeholder groups' information needs.

In this study, it is argued that the more a firm pays attention to different groups of stakeholders, the more it may use management controls related to web site content. Indeed, since there are more different groups of stakeholders to keep informed, there may be different information needs to be anticipated and various types of web site content to be reviewed, updated, and improved. A greater stakeholder orientation (greater overall attention paid to different groups) could therefore lead to more complex risk management-related controls because the identification of risks inherent in web-based corporate reporting could vary from one type of information to another. For instance, a firm can be concerned about the risk inherent to providing information to competitors when disclosing promotional content; it can be concerned about risk inherent to lawsuits when disclosing financial content that is not audited. Some types of web site content can be of interest

for more than one group of stakeholders (e.g., product/service information), resulting in overlapping information needs. Within the organization, different groups can therefore be involved in the web-based reporting process as representatives of the various stakeholders' information needs (e.g., marketing, legal, and communications departments, respectively involved to identify and follow up on the information needs of clients, governments/political groups, and shareholders/investors). It then becomes important to put in place procedures to facilitate the settlement of conflicts between the groups involved and to share a common vision for the site, one that is in line with the overall communication strategy and with the corporate image. This is particularly important because all types of information can be disclosed in the same "communication medium" (i.e., the organization's web site). Overall, the management control package related to web site content could help (i) to identify and disclose online the information that should be relevant for a group (or groups) of stakeholders explicitly referred to in the corporate mission or vision; (ii) to minimize the risk of information overload and to assess the relevancy of duplicating information on different web pages designed for specific stakeholders (e.g., information about products and services in the Investor relations' web site section as well as in the Clients' web site section); (iii) to make sure that the inquiry procedure enables users to analyze the web site content and arrange it in a suitable form; and (iv) to provide assurances to stakeholders that the web content is reliable and that personal information provided by web site users is secured. The above discussion provides the basis for Hypothesis 2.

H2. There is a positive association between stakeholder orientation and the extent of use of a management control package related to web site content.

Influence of a Management Control Package on Web Site Content

Overall, a positive association between the extent of use of a management control package and web site content is expected because management controls may be designed to assist managers in achieving some level of quantity and quality of the web site content. While little evidence has been provided in past research to support that link, the management accounting literature encompasses numerous studies describing the effects of management controls in various settings (e.g., Anthony & Govindarajan, 2004; Simons, 2000; Merchant, 1998). Based on that stream of research, we argue that a

management control package contributes to web site content (i) by focusing the attention of organizational actors on web-based corporate reporting issues; (ii) by influencing people to change their behavior; (iii) by supporting managers and by helping organizational actors communicating information.

In particular, planning may help to disclose more and better information on a web site. Indeed, planning mechanisms such as the incorporation of strategic actions and decisions about web-based corporate reporting into the organization's overall communication strategy, the identification of risks inherent in web-based corporate reporting, the anticipation of stakeholders' information needs and, consequently, financial, human, and material resource availability, on a long-term basis, should help managers to maintain and improve web site content quantity and quality.

Similarly, using a more developed monitoring system to follow up on the Web site content (e.g., user satisfaction surveys or tests using the firm's web site) allows for the output of the web-based reporting process to be assessed. Consequently, this output can be compared with some standard or expectation to identify potential gaps. Those gaps can be communicated within the organization and alter behavior to maintain or improve the quantity and quality of the web site content.

Furthermore, the involvement of different groups of people in the web-based reporting process may also help to maintain and improve web site content. Indeed, the disclosure of particular types of information can be used to gain or maintain the support of particular groups (Richardson & Welker, 2001; Deegan & Blomquist, 2006). Stakeholder representatives (e.g., shareholders, clients, community at large, lobby groups), internal departments (e.g., finance, marketing, communications), or external consultants can be involved to make sure that stakeholders' information needs will be taken into consideration. The involvement of different groups could help to put online better and more information, in other words to satisfy the information needs (more quality) of multiple stakeholder groups (more quantity).

Lastly, standardization (which includes defining the roles and responsibilities of the people involved and developing informal or formal procedures to control content) may also facilitate the web-based reporting process and influence the quantity and quality of web site content.

The above discussion leads to Hypotheses 3 and 4.

H3. There is a positive association between the extent of use of a management control package related to web site content and the quantity of web site content.

H4. There is a positive association between the extent of use of a management control package related to web site content and the quality of web site content.

Control Paths

The size of an organization can influence how it is managed (Chapman, 1997; Chenhall, 2003). Overall, larger firms put more importance on planning and follow-up procedures (Chenhall, 2003; Merchant, 1984; Thomas, 1986; Xiao, Dyson, & Powell, 1996). In addition, they decentralize to a greater extent their activities and use more formal modes of communication (Chenhall, 2003).

Since larger firms are commonly characterized by more revenues, more assets, more employees and, if applicable, greater market capitalization, they could allocate more financial, human and material resources to maintain and improve their web site content. More people could therefore assess, write, gather, screen, edit, display online, or remove information disclosed on the web site. Consequently, in larger organizations, there will be a greater need to assist managers by using controls such as ensuring the consistency of the information with the overall corporate image and communication strategy, the various checks on the web site content, the internal and external groups' involvement, human interaction and procedures to fully take advantage of available material resources. Moreover many studies indicate that organization size is positively associated with the quantity of web site content (Debreceny et al., 2002; Ettredge et al., 2002a; Héroux & Cormier, 2002; Marston & Polei, 2004; Pirchegger & Wagenhofer, 1999; Xiao et al., 2004). In the light of the above discussion, we control for the potential effect of an organization's size on the quantity of web site content as well on management controls related to web site content (dotted lines in Fig. 1).

From an accounting and finance perspective, the "dynamism-stability" dimension of environmental uncertainty can refer to stock volatility as compared to the market (referred to as firm-specific market risk, systematic risk, or beta) while "homogeneity–heterogeneity" can refer to the extent to which firms are diversified (unsystematic or specific risk); the latter could influence corporate reporting while the former does not seem to do so (Thomas, 1986). Consistent with these results, Debreceny et al. (2002) and Marston and Polei (2004) found no statistical association between beta and web site quantity of content. Some could suggest that firms

perceiving greater environmental uncertainty can use their web site to keep stakeholders informed about changes in financial condition, products/ services offered or prices, by disclosing more information. However, we argue that when the environment is perceived to be more uncertain, the integrity and reliability/credibility of the information might be compromised and incorrect information could affect a firm's reputation and even expose it to lawsuits. Firms can therefore choose to disclose less quantity, and to be more careful about the quality of the information disclosed. In the light of the above discussion, and because ''perceived uncertainty is more likely to influence management's choice of reporting methods than "actual" riskiness'' (Thomas, 1986, p. 267),[3] we control for the potential influence of PEU on the quantity of web site content (dotted line in Fig. 1).

RESEARCH METHOD

Data was collected in three steps. First, a mail survey was sent to managers in charge of the web site of a sample of Canadian organizations. The respondents should have an overview and a sufficient knowledge of the management of web site content. Second, the web sites of the responding firms were analyzed based on a list of 132 items. Lastly, data related to the size of the target firms was collected from external databases. These three steps are discussed next, followed by the measurement and the validation of the constructs.

Survey

Target Population and Survey Implementation
A questionnaire was developed based on guidelines provided (Dillman, 2000), consulting interviews and instruments adapted from previous studies. Seven-point Likert scales were used. English and French versions of the questionnaire were developed and tested. Six academics and two external professionals (proofreader and translator) revised it and 12 managers in charge of web sites (who were not taking part in the study) tested it. The questionnaire takes approximately 25 min to complete.

The *Financial Post* electronic database contains information that is updated daily on over 5,600 Canadian organizations. To avoid small organizations having no (or too much basic) management control, all of the

626 organizations having annual revenues greater than $50 million were
selected from this database. The target population is comprised of 551
organizations considering the removal of the firms that did not have a web
site (13); firms whose web site is not distinct from that of their foreign parent
company (17) or is not managed in Canada (8); or firms that were engaged
in a dissolution process (7), that have a web site incorporated in that of a
parent company already included in the target population (18), or that are
not incorporated in Canada (12).

The identification of managers in charge of web sites as the targeted
respondents was crucial because the survey is organized around themes
requiring an overview and sufficient knowledge of the management of web
site content. Across organizations, for example, officers in charge of
communications, marketing, information systems, or technology as well as
webmasters were identified as managers in charge of web sites. This step was
spread out over a period of 4 weeks before mailing the survey. For each of
the 551 organizations in the target population, (i) an attempt is made to find
the name, address, and telephone number of "potential" targeted managers
by scrutinizing information about directors in the *Financial Post* database or
on an organization's web site; (ii) as a prenotice procedure, this information
is validated by e-mail or by telephone once, and twice if necessary. The
survey was mailed including a cover letter and a postage-paid envelope.[4]

The follow-up procedures involved four steps: (1) mailing of a thank you/
reminder postcard about 3 weeks after the questionnaire mailing; (2) a few
days before mailing a replacement questionnaire, emailing respondents who
had previously agreed to participate but did not return the survey yet;
(3) mailing of a replacement questionnaire to all the nonrespondents about
5 weeks after the first questionnaire mailing; (4) making a final contact with
organizations that had positively answered any of our previous contacts,
spread out between the second and the third month after the first
questionnaire's mailing.

Sample
A total of 180 managers had completed the survey (response rate 32.7%).[5]
The sample is made up of 165 firms listed on the Toronto Stock Exchange,
three companies listed on the TSX Venture Exchange, seven crown
corporations and five major subsidiaries of large parent companies, from
seven industries (Energy, 13.9%; Material, 16.1%; Industrial, 17.8%;
Consumer, 20%; Financial services, 14.4%; Technology and telecommuni-
cations, 12.2%; Utilities, 5.6%).

On average, respondents have 15.6 years of professional experience; they have worked for about 7 years within their organization and 4 years at their current position. They come mainly from four different general backgrounds: information technology (25.6%), communications (18.9%), marketing (13.3%), administration (accounting, management, finance, economy) (10.6%), a combination of two of these four backgrounds (25%), and others (6.6%). To test if the general background provided a bias in results, average scores for variables were compared between four main backgrounds: information technology (46); communications (34); marketing (24); and administration (19). Since there were no significant differences between the four groups, there is some evidence for a lack of response bias.

A two-step analysis was performed to assess nonresponse bias. First, the average scores for assets, revenues, and the number of employees were compared with 551 target population firms and with 371 nonrespondent firms. Overall, they are not significantly different from the target population, nor are they from those of the nonrespondents. It should also be noted that industries that are represented in the target population are covered in almost the same proportions in the sample firms. This provides some evidence that the sample is representative of the target population. Second, the average scores for all variables were compared for a subsample of 61 early respondents (before the mailing of a thank you/reminder postcard) and 28 late respondents (used a replacement questionnaire). There were no significant differences, providing some evidence for lack of nonresponse bias.

Web Site Analysis

web site content was analyzed over a period of 3 months coinciding with the beginning and the end of receipt of the questionnaires. We assess the quantity of web site content by examining whether a list of items was disclosed or not on the web site.

Firms could decide to reproduce information required by regulators in PDF documents disclosed on web sites (Ettredge et al., 2002a; Smith & Pierce, 2005). To take into consideration this potential decision to ease distribution, items on the list were considered as disclosed in web site content whether they were in PDF or html format (e.g., annual and quarterly reports, annual information, proxy circular, governance guidelines, code of ethics, and periodic general information such as fact sheet). However, since our purpose is to examine whether management control

used to maintain and improve web site content could influence the quantity of web site content, we did not analyze the content of PDF documents. Overall, this procedure leads us to recognize a smaller quantity of content for firms reproducing PDF documents if compared to the firms combining PDF and html formats. It should also be noted that hyperlinks can be considered as content that can lead a web user to find more detailed information in some other web sites (e.g., financial information, stock quotes, press releases, market information). Since a firm can decide to disclose them on its own web site, external links were also considered on the list of items (regardless whether the link was available on the site).

The list of items had initially been tested with the web sites of the 12 first respondent organizations. Thereafter, two different people (a research assistant and one of the researchers) examined some large sample firm web sites. Information about this study and instructions about how to use the list were initially given to the research assistant who explored a few web sites before analyzing any particular one. After each web site analysis, the two lists for each firm were compared and any differences were reconciled. This procedure was halted when all seven business sectors under study had been covered more than once and when there were almost no differences in coding. In total, 16 sample firm web sites were analyzed twice. This procedure contributes to develop rules for coding. One of the researchers examined the remaining 164 sites.

External Databases

After collecting data from a survey and analyzing web sites, external databases were used to complete the data set. Accounting figures from the last completed fiscal year relating to the data collection period were used to measure the size of the organization. More specifically, four indicators were mainly collected in the *Financial Post* database: (i) total assets, (ii) total revenues, (iii) number of employees, and (iv) market capitalization.

Measurement of Constructs

Appendix A presents the reliability and validity of questionnaire items. Appendix B represents the list of 132 items used to analyze web site content. Descriptive statistics and the correlation matrix are presented in Appendix C.

PEU is measured overall using three items adapted from Miles and Snow (2003 [1978]) (dynamism) and five items adapted from Miller and Friesen (1984) (hostility and heterogeneity). The respondents were asked to indicate to what extent the eight items were representative of the company's main business environment (not representative = 1, very representative = 7). A higher mean score indicates that the environment is perceived to be more uncertain.

Stakeholder orientation represents an overall measure adapted from the instruments of Greenley and Foxall (1997) and Waterhouse and Svendsen (1998). The respondents were asked to indicate to what extent their organization pays attention to six groups interested in its business (not representative = 1, very representative = 7). A higher mean score indicates a greater stakeholder orientation (a greater overall attention paid to different groups).

The four management controls related to web site content were measured as follows. Based on the work of Delmas (2001), a three-item instrument has been developed to measure decentralization. The respondents were asked to indicate to what extent various groups are involved in (i) writing, and (ii) delivering the information content, and (iii) improving the Web site content (not involved = 1, highly involved = 7). The groups were selected based on consulting interviews and include, among other groups, marketing, communications, technology/IT, multidisciplinary Internet team, finance/administration, various business units/subsidiaries, top management, clients, and external consultants. A mean score is calculated for each of the three items. A higher mean score indicates a greater involvement of different groups in activities related to web site content, and thus more decentralization related to web site content activities.

Using four items adapted from Sabherwal and King (1992) and three items based on consulting interviews, we measured the standardization of mechanisms put in place. The respondents were asked to indicate to what extent seven items are representative of the mechanisms for managing information content (not representative = 1, very representative = 7). A higher mean score indicates greater standardization surrounding web site content.

Planning is measured with an instrument adapted from Mak (1989) and Miller and Friesen (1984). The respondents were asked to indicate to what extent six items are representative of the mechanisms for managing information content (not representative = 1, very representative = 7). A higher mean score indicates more planning.

Based on Miller and Friesen (1984), Mak (1989), Chenhall and Langfield-Smith (1998) and on consulting interviews, ten items are used to measure monitoring. The respondents were asked to indicate to what extent the various items are representative of the system put in place to follow up on the Web site's information content (not representative = 1, very representative = 7). A higher mean score indicates a more elaborate monitoring system.

Based on consulting interviews, a four-item instrument was developed to measure the quality of the sample firms' web site content (type, format, user-friendliness, content as a whole) in comparison with their leading competitors (significantly lower = 1, significant higher = 7). A higher mean score indicates higher quality of the web site content.

A list of 132 items (Cronbach's $\alpha = 0.92$) was used to measure the quantity of web site content by calculating a content index (1 if an item is disclosed on web site; 0 if not). This list had been developed by crosschecking items from previous studies[6] and judging criteria used for the CICA (2003 and 2004) "Corporate Reporting Awards," "Excellence in Electronic Disclosure" category. In order to show the diversity of the content examined, we present Appendix B using four categories, namely (i) financial, (ii) nonfinancial, (iii) promotional, and (iv) transactional. Financial content can refer to accounting information (e.g., results disclosed in the annual report) or not (e.g., quoted market price). Nonfinancial content is split into six parts: general information (e.g., mission, profile, history, contact, updating date, and legal notice), corporate governance, operations/development, human capital, social responsibility, and products/services/clients. Promotional information includes details on products/services, pre- and after-sales services. Transactional information principally refers to Internet sales conditions.

Lastly, an overall measure composed of four items used in the web-based reporting literature (e.g., Craven & Marston, 1999; Ettredge et al., 2002a; Oyelere et al., 2003) was used for organization size, namely the natural log of total assets, total revenues, number of employees and market capitalization (if applicable). A higher mean score of those items indicates a larger firm.

Validity and Reliability of Constructs

Considering the development and/or adaptation of various measurement instruments, the statistical validation of the constructs is a crucial step.

First, to establish the reliability of each construct, we examined the Cronbach's α and composite reliability.[7] Moreover, to establish the convergent validity of each construct, the variance extracted has been analyzed[8] and first-order confirmatory factor analysis (CFA) have been performed. Three main elements were examined for the CFA, namely the significance of the standardized factor loading, the R^2 for each item, and the overall acceptability of the measurement model using χ^2 statistics and three fit indices. Those indices, namely NNFI (nonnormed fit index), CFI (comparative-fit index), and RMSEA (root mean square error of approximation) reflect two complementary types of indices (absolute fit and incremental fit measures) and they are among those that are the most frequently reported.[9] Lastly, discriminant validity has been assessed by comparing the variance extracted from each individual with the squared correlation between latent constructs (Fornell & Larcker, 1981).[10]

Appendix A presents the statistics of measurement analysis for the initial and respecified models. Respecifications were necessary because specific items reflected inadequate R^2 (<0.30) and insufficient variance extracted (<0.50), namely (i) PEU (removal of four items), (ii) standardization (removal of two items), and (iii) monitoring (removal of five items). After those respecifications, all constructs exceed the recommended cut-off point for the Cronbach's α and composite reliability, exhibit an acceptable model fit, reflect adequate R^2, and all factor loadings are statistically significant ($p<0.01$). Variances extracted for four constructs were improved and got closer to the 0.50 recommended cut-off point for the variance extracted (stakeholder orientation 0.413; quality of web site content 0.446; monitoring 0.421; and standardization 0.447). Lastly, the comparison between the variances extracted and the squared correlations (not reported here) supports the discriminant validity of the constructs of the survey. Overall, based on the CFA and the other tests discussed above, all constructs reflect satisfying validity and reliability.

Data Analysis

Structural equation modeling (SEM) is used to test the hypotheses. We analyzed data collected with LISREL 8.72 and used a covariance matrix as an input matrix.[11] Considering the multivariate nonnormal distribution, maximum likelihood estimates (which are robust to such violations) and multiple indices are used to check the overall goodness-of-fit of a model (Bentler & Chou, 1987). An overall structural model is used to establish the

relationships among the source of pressure, management control package, and web site content. A sample size varying between 100 and 200 cases is adequate for small-to-medium structural-equation models, or between 5 and 10 subjects per estimated parameters (Bentler & Chou, 1987; Anderson & Gerbing, 1988) while a statistical power of 0.80 or more is suggested (MacCallum, Browne, & Sugawara, 1996). In this study, the sample size ($n = 180$) and the ratio of subject per parameter ($180/30 = 6$) are adequate to test the overall structural model. However, based on the guidelines of MacCallum et al. (1996), the power is slightly below the threshold (0.76).

RESULTS AND DISCUSSION

Descriptive Results

In respect to the first research question, this paper aims to examine to what extent management controls are used to support web site content. On the one hand, descriptive results (Appendix C) suggest a moderate use of planning to control web site content (mean of 4.71 out of 7). On the other hand, the extent to which monitoring, decentralization, and standardization are used tends to be low (2.95, 3.05, and 3.77, respectively). Overall, the mean use of the four management controls in a context of web-based corporate reporting is 3.62. This suggests that despite the rapid spread of web-based corporate reporting over the years, the development of management controls to support the maintenance and improvement of web site content is not yet well implemented in organizations.

According to the second research question, we examine to what extent the management controls related to web site content operate as an interrelated whole. In order to analyze this issue, we conduct a second-order CFA with the four management controls. This procedure assesses whether the four controls pertain to a same latent construct. Significant results would suggest that the four controls represent a management control package that operates as an interrelated whole. Otherwise, the four controls would be representative of a management control package that is not operating as an interrelated whole. Table 1 presents the results of the second-order CFA.[12] The results of the "unified construct" exceed the recommended cut-off point for the Cronbach's α and composite reliability, and exhibit acceptable model fit. They reflect adequate R^2 and variance extracted, and all factor loadings are statistically significant ($p < 0.01$). In other words, in our sample, the four

Table 1. Management Control Package: Second-order Confirmatory Factor Analysis on Four Management Controls.

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Decentralization	0.675**	0.456	–	–
Standardization	0.792**	0.627	–	–
Planning	0.689**	0.475	–	–
Monitoring	0.675**	0.456	–	–
Goodness-of-fit of the model:	$\chi^2 (144) = 233.77$, $p = 0$; NNFI = 0.963; CFI = 0.969; RMSEA = 0.059		–	
Cronbach's α:	0.895			
Composite reliability:	0.801			
Variance extracted:	0.503			

*Significant at the 0.05 level; **Significant at the 0.01 level.

management controls related to web site content seem to operate as an interrelated whole.

Overall Structural Model

Table 2 presents the standardized results of the overall structural model in terms of path coefficients, z statistics, proportion of variance (R^2), number of iterations and goodness-of-fit indices. Since these statistics were adequate, it was not necessary to respecify the theoretical model and to use starting values. Considering the conclusive results of the second-order CFA, the four management controls are examined collectively as part of a unified construct. First, significant relationships have been observed between the management control package and (i) PEU (0.268, $p < 0.05$), (ii) stakeholder orientation (0.313, $p < 0.01$), and (iii) organization size (0.451, $p < 0.01$). The proportion of variance in a management control package that is accounted for by the latent variables is 50.1%. Second, the results suggest a significant influence of PEU (-0.262, $p < 0.01$) and organization size (0.825, $p < 0.01$), but no significant influence of management control package on the quantity of web site content. The proportion of variance in the quantity of information that is accounted for by those latent variables is 83%. Lastly,

Table 2. Standardized Results of the Overall Structural Model.

Description of Path			Path Coefficients	Z Statistics	R^2
PEU	→	Management control package	0.268	2.435*	0.501
Stakeholder orientation	→	Management control package	0.313	2.836**	
Organization size	⇢	*Management control package*	*0.451*	*4.434***	
Management control package	→	Quantity of information	0.156	1.477[n.s.]	0.830
PEU	⇢	*Quantity of information*	*−0.262*	*−2.858***	
Organization size	⇢	*Quantity of information*	*0.825*	*7.781***	
Management control package	→	Quality of information	0.681	5.556**	0.464

Goodness-of-fit indices: χ^2 (48) = 65.18, p = 0.05; NNFI = 0.980; CFI = 0.985; RMSEA = 0.045
Number of iterations: 9

*$p < 0.05$; **$p < 0.01$; n.s., not significant.
Correlations between exogenous factors are not tabulated.
Control paths in italics.

a significant positive relationship between management control package and the quality of web site content is suggested (0.681, $p < 0.01$; $R^2 = 0.464$). Overall, this model respects the recommended threshold mentioned previously for the goodness-of-fit indices (NNFI, CFI, and RMSEA). This indicates a good fit of the data to the model.

Sensitivity Analyses

Specific Structural Models

To validate the robustness of the overall structural model, additional analyses on specific structural models for each of the four management controls have been conducted. In those specific models, management control is operationalized as one specific dimension at a time (planning, monitoring, decentralization, or standardization). According to standardized results (not tabulated), positive and significant relationships are suggested between stakeholder orientation, as well as organization size, and each of the management controls. PEU is positively and significantly associated with two out of four management controls, namely decentralization and standardization. Furthermore, similar to the overall structural model: (i) no significant relationship is observed between any of the four management controls and the quantity of information; (ii) each of the management controls is positively and significantly associated with the quality of web site content; and (iii) the other paths remain qualitatively unchanged. In short, the results from specific models suggest that the overall model is robust.

Subgroup Analyses

A web site can aim at maintaining relations with stakeholders (shareholders/investors, clients, employees, suppliers, governments/political groups, public at large) or at encouraging electronic transactions (online orders, online services such as requests, customer service, bids, calculating tools). Starting around 1996, web-based reporting literature had begun analyzing web site content over time. Overall, this literature shows a tendency to start web-based reporting with financial information, to expand to nonfinancial content, to go from a more basic site (with more static or regulatory information) to more complex information (with more dynamic or changing information). In other words, "[a]s companies move toward web-based reporting, a natural starting point is regulatory financial disclosures" (Williams, 2003). As suggested by consulting interviews, maintaining a

transactional web site is more complex than maintaining one that is only relational. A web site may therefore have been built on relational information first, before being considered as transactional and disclosing information in that respect (e.g., detailed products or services sold online, online sales conditions). In that sense, moving from a relational to a more transactional web site, or from static to more dynamic web site content, can be an indicator of the web site's maturity. The more a web site is transactional or continually adjusted (the more the web site is ''mature''), the more web site content may need to be controlled using a more elaborate management control package specifically related to web site content. Therefore, we performed subgroup analyses with the intent to explore the results from another angle, in order to refine the discussion.

We first split the observations into two subgroups (more or less continually adjusted), based on the median of the questionnaire item ''web site is continually adjusted, scale 1–7.'' Results shown in Table 3 are similar to those of the overall structural model except for the following paths: (i) PEU has no significant influence on management control package; (ii) PEU has no significant influence on the quantity of information disclosed when the site is less continually adjusted; (iii) there is no significant relationship between stakeholder orientation and management control package when a web site is more continually adjusted; and (iv) there is a significant relationship between the management control package and quantity of information when a web site is more continually adjusted.

Second, we split the observations (more or less transactional) into two subgroups, based on the median for the questionnaire item ''web site explicitly aims at encouraging Internet transactions, scale 1–7.'' As illustrated in Table 3, we observe results that are similar to those of the overall structural model, except for the following paths: (i) PEU has no significant influence on management control package; (ii) PEU has no significant influence on the quantity of information disclosed when the site is less transactional; and (iii) the influence of the management control package on quantity of information becomes significant when the site is more transactional.

Overall, in the light of subgroup analyses: (i) when the site is less continually adjusted or less transactional, PEU does not significantly influence the management control package, or the quantity of information disclosed and (ii) when the site is more continually adjusted or transactional, the management control package is positively associated with the quantity of information disclosed on the web site.

Table 3. Subgroup Analyses.

Description of Path		Web Site is More or Less			
		Continually adjusted		Transactional	
		Less ($n = 79$)	More ($n = 101$)	Less ($n = 83$)	More ($n = 97$)
PEU $\longrightarrow$ Management control package		$0.196^{\text{n.s.}}$	0.312^{**}	$0.229^{\text{n.s.}}$	0.284^{*}
Stakeholder orientation $\longrightarrow$ Management control package		0.580^{**}	$0.156^{\text{n.s.}}$	0.377^{*}	0.416^{*}
Organization size $\cdots\!\longrightarrow$ *Management control package*		0.456^{**}	0.375^{**}	0.451^{**}	0.292^{*}
Management control package $\longrightarrow$ Quantity of content		$0.030^{\text{n.s.}}$	0.200^{*}	$0.127^{\text{n.s.}}$	0.231^{*}
PEU $\cdots\!\longrightarrow$ *Quantity of content*		$-0.188^{\text{n.s.}}$	-0.276^{*}	$-0.211^{\text{n.s.}}$	-0.304^{*}
Organization size $\cdots\!\longrightarrow$ *Quantity of content*		0.869^{**}	0.823^{**}	0.862^{**}	0.769^{**}
Management control package $\longrightarrow$ Quality of content		0.590^{**}	0.748^{**}	0.594^{**}	0.732^{**}
Goodness-of-fit indices: χ^2		45.04	56.12	56.94	68.34
		$p = 0.549$	$p = 0.197$	$p = 0.176$	$p = 0.028$
NNFI		1.0	0.981	0.958	0.962
CFI		1.0	0.987	0.969	0.973
RMSEA		0.0	0.041	0.044	0.066
Number of iterations		11	12	16	8

$^{*}p<0.05$; $^{**}p<0.01$; n.s., not significant.
Correlations between exogenous factors are not tabulated.
Control paths in italics.

Industry Effect

Since industry membership can influence the quantity of web site content (Ettredge, Richardson, & Scholz, 2001; Oyelere et al., 2003; Xiao et al., 2004), we test its effect on the results. We run the overall structural model with the quantity of web site content being adjusted for the industry by subtracting the dominant two-digit industry average from the respective firm counterparts. The results remain qualitatively unchanged. This suggests that the signs and the significance of relationships are not influenced by the industry. Furthermore, multiple comparisons between the seven industries (one-way ANOVA on each variable, with a Tukey's HSD or Dunnett's C test) confirmed this result: out of 189 comparisons between industries (21 pairs of industries × 9 variables), only three revealed significant differences.

Discussion

Associations Among PEU, Stakeholder Orientation and Management Control Package

In accordance with H1, overall results suggest that a greater (lesser) PEU leads a firm to use management controls related to web site content to a greater (lesser) extent. This implies that managers' perceptions of the environment influence the extent to which they will be assisted by a management control package to improve the web-based reporting. More specifically, in accordance with the specific models, a greater PEU leads a firm to greater decentralization and standardization related to web site content. Indeed, a greater PEU can result from intense price or product competition or from diversity in competitive tactics or client tastes (Miller & Friesen, 1984). Since this requires creativity and adaptability, firms might have difficulty anticipating the future (Merchant, 1984) and identifying relevant tools to assess a process. A greater PEU can therefore lead a firm to imitate the strategic responses of others (Milliken, 1987; DiMaggio & Powell, 1983). The development of sophisticated planning and monitoring mechanisms could then become less important. However, decentralization and standardization may be used to better control the information, by respectively allowing to benefit from different groups' expertise and to identify stakeholder information needs, and by facilitating the reporting process. Furthermore, there is some indication that PEU might not have a significant influence on the extent to which a management control package is used when the site is less continually adjusted or less transactional. This may be because a less mature site may contain information that is less sensitive to

changes in regulations or competition (e.g., profile of the firm, historical information, financial information), resulting in a lesser need to use a management control package.

As was expected in H2, overall results indicate that a greater (lesser) stakeholder orientation leads a firm to use a management control package related to web site content to a greater (lesser) extent. In other words, the more (less) a firm pays attention to different stakeholder groups, the more (less) it plans, monitors, decentralizes, and standardizes to control its web site content. This suggests that stakeholder accountability is generally reflected in management control. In addition, there is some indication that the stakeholder orientation's influence on the use of a management control package might not be significant when the web site is more continually adjusted. It may be that stakeholder orientation is taken as a starting point to ensure that the development of management controls has strategic foundations to better guide the web site content. In order to satisfy stakeholder information needs, a web site's aim is therefore, at the very least, anchored in stakeholder orientation. After a while, once the web-based reporting process has been established, management controls might be less aligned with stakeholder orientation. This may suggest a potential weakness that needs to be addressed in further research.

Association Between Management Control Package and Web Site Content
Contrary to our expectations, providing no support for H3, overall results show that a management control package does not significantly assist managers in disclosing more information on a web site. Moreover, this finding holds true for each of the four management controls under study. These results may be explained by the fact that our study is cross-sectional. Therefore, we do not capture at what point a greater (lesser) use of a management control package might be useful to enhance (reduce) the quantity of web site content. However, there is some indication that the expected positive relationship between the use of a management control package and the quantity of web site content could be significant when a web site is more mature (more continually adjusted, more transactional). This may be because it is more complex and difficult to maintain the content of a site that is continually adjusted or to maintain the content of a transactional site as compared to a relational one. A transactional site contains information in addition to that which is "traditionally" disclosed by reproducing PDF files (e.g., transactional content). At some point in time, an organization's web-based reporting strategy is refined and moves to a higher level. From a site initially maintained and improved to complement

the overall communication strategy, the site begins to be also considered as a strategic opportunity. Management controls could then be used to a greater (lesser) extent to deliver more (less) web site content.

Supporting H4, overall results indicate that making greater (lesser) use of a management control package contributes to a greater (lesser) quality of web site content. In particular, a greater use of planning, monitoring, decentralization, or standardization seems to be associated with a greater quality of web site content relative to one of the leading competitors. Furthermore, this relationship also holds true regardless of web site maturity. Since managers may try to achieve a desired level of quality to better meet stakeholders' information needs, results suggest that firms might benefit from a greater use of management controls to improve web-based corporate reporting.

Additional Comments

Results suggest that larger (smaller) firms use management controls to a greater (lesser) extent to manage their web site content. The relationship holds true regardless of the web site's maturity. In line with the management accounting literature, this suggests that the complexity of activities, the volume of information that needs to be handled and the availability of human, financial, and material resources are significant drivers of the use of management controls to maintain and improve web site content. Even if, *a priori*, management controls could be helpful to any organizations to better control web site content, it is not free of difficulties and costs. Smaller firms may therefore use a management control package that is aligned with their less complex reality and with their more limited resources. In accordance with web-based reporting studies, results also indicate that size significantly and positively influences the quantity of information disclosed. This reflects an organization's reality: larger firms have to handle a greater volume of information because they are more complex and are often more exposed to external pressures.

Results indicate that PEU has a significant and negative influence on the quantity of web site content. This may happen because when managers perceive greater environmental uncertainty, they may be more careful about information disclosed on their organization's web site. As a result, a firm can disclose less content because it is difficult to ensure the integrity and the reliability of the information. There might be a greater focus on content that is more traditionally "controllable" (e.g., audited financial information requested by regulators). However, there is some indication that the negative relationship between PEU and the quantity of information

disclosed might not be significant when the web site is less mature (less continually adjusted or less transactional). This suggests that at earlier stages of web site development, the quantity of web site content may not be aligned with managers' perceptions of environmental uncertainty.

CONCLUSION

While the idea of control package goes back to the early 1980s, the empirical accounting literature has been reluctant to examine this broader view of management control. Furthermore, while past research has addressed the use of management control for the organization as a whole, as well as specifically in different contexts, we do not know much about the web-based corporate reporting context. The general aim of this study was to examine the antecedents and consequences of a management control package used in a web-based reporting setting. More specifically, this papers describes and tests the relationships among two sources of pressure (PEU and stakeholder orientation), a management control package comprising four controls (decentralization, standardization, planning, and monitoring), as well as two aspects of web site content (quantity and quality). The results suggest that PEU and stakeholder orientation are key factors that influence the extent of use of a management control package to support web-based corporate reporting. Also, the extent of use of a management control package is associated with the quality of web site content but not with the quantity of information disclosed.

This study contributes to the emergent stream of research devoted to the management control package by empirically examining (i) the deployment of a collection of controls; (ii) the extent to which these controls operate as an interrelated whole; and (iii) the factors that foster their use, as well as their ability to maintain or alter patterns in organizational activity. Moreover, our attention has been devoted to a specific object of control, namely a control package to manage web-based corporate reporting, while management control has been mostly studied for the organization as a whole. Furthermore, this object of control is relevant because it is comprised of information disclosed outside the organization, while studies typically involve information available mostly for internal use. Lastly, this study contributes simultaneously to the management control, reporting and web-based reporting literatures by creating a bridge between management and financial accounting research. By depicting the control of web site content, this paper enters into the "black box" and provides valuable information

from inside the organizations. To our knowledge, this is the first study on management control in a reporting setting, and on its influence on reporting. This represents a significant integration of two major streams of research in accounting.

The results of this study have practical implications that could be of interest for managers, accounting standard-setters, and regulators. Overall, they can help firms to adopt a policy that describes management controls used to maintain and improve web site content. In particular, results describe specific mechanisms that can be selected to assist managers in achieving the organization's goals or the web site's aim. Moreover, they could help managers to acknowledge the effect of PEU and stakeholder orientation on the use of management controls related to web site content. This provides insight about means taken by organizations to improve web-based corporate reporting. In addition, there is some indication that management controls might not be as useful in disclosing more content when the site is at an early stage of maturity. In other words, before thinking about adding more web site content, organizations might want to make sure the site is functional with basic content.

In spite of its practical implications and contributions to the management accounting and reporting literatures, this study is subject to some limitations that can be turned into relevant research avenues. First, since firms may use management controls to support the selection of the information to be disclosed and because management controls seem to influence the quality of information, further research could specifically address the potential information overload problem that was not an issue a decade ago. Moreover, the conceptual framework is based on an assessment of web-based corporate reporting in terms of quantity and quality. It could be interesting to assess the reporting process in terms of efficiency or the long-term effect on information users. Also, the management control package examined in this paper is not necessarily exhaustive as it does not include all potential controls. Future qualitative studies could provide valuable insight on the integration of other controls in a package related to web site content.

From a methodological standpoint, various issues can be taken into consideration. First, for any proposed structural model, other structural models tested using the same data may suggest different relationships among latent constructs and reflect equivalent levels of fit (MacCallum et al., 1996). The possible existence of an equivalent model is problematic and constitutes a limitation of the current results obtained. Second, since changes in the use of management controls to support web-based corporate reporting over time have not been specifically addressed in this

paper (the study is static, i.e., it does not incorporate the evolution of management controls or web site content over time) a longitudinal study could be a relevant research avenue. Such a study would consider the dynamic inherent in the web-based reporting process. It would also make it possible to examine the potential mimetism with respect to the reporting behavior when the environment is perceived as being more uncertain. Third, the content index used to measure the quantity of content does not say whether information disclosed on web sites corresponds more to stakeholder needs than information disclosed in a more traditional way.

NOTES

1. Accounting standard-setters, regulators, and prior accounting research refer to Internet reporting, corporate reporting on the Internet, web-based reporting, Internet-based disclosure, online reporting or electronic disclosure when referring to web sites. In this study, the expression "web-based corporate reporting" has been chosen to better reflect what will be examined.

2. Four managers in charge of a web site in large organizations, one consultant in numerical relations whose major clients are large private firms and one top manager of a fund management company were met. The six consulting interviews were conducted in five organizations (two public organizations; four large organizations; representing three business sectors), for a duration of 90–120 min each, totalling almost 11 h of recording.

3. According to Chenhall (2003), a distinction should be made between uncertainty and risk: "Risk is concerned with situations in which probabilities can be attached to particular events occurring whereas uncertainty defines situations in which probabilities cannot be attached and even the elements of the environment may not be predictable" (p. 137).

4. In the cover letter and in the survey, it was stated that information provided will remain strictly confidential and anonymous, that it will only be used for future publication of academic or educational articles, and, if so, only a summary of statistics will be published. In the survey, it was also stated that the summary report delivered on request to the organization taking part in the study will not contain information allowing for the respondent to be identified and that the questionnaire has an identification number for management and follow-up purposes only.

5. Among all nonrespondents, it should be noted that 19 firms indicated that they will not participate in this study without providing any reason while 53 motivated their refusal as follows: the organizational policies do not allow for participation in any study (17); they cannot participate because of an important event such as a reorganization (12); lack of interest in the topic (3); lack of time or resources (20); for confidentiality reasons (1).

6. See Xiao et al. (2004), Marston and Polei (2004), Héroux and Cormier (2002), Debreceny, Gray, and Mock (2001), Debreceny et al. (2002), Ettredge et al., (2002a), Deller, Stubenrath, and weber (1999), Pirchegger and Wagenhofer (1999), Williams

and Ho Wern Pei (1999), Cormier and Magnan (1999, 2003), and Flynn and Gowthorpe (1997).

7. For both indicators, the constructs must exceed the recommended cut-off point of 0.70 to reflect acceptable level (Nunnally, 1967; Fornell & Larcker, 1981).

8. The variance extracted must exceed the recommended cut-off point of 0.50 to reflect acceptable validity (Hair, Anderson, Tatham, & Black, 1998).

9. The threshold values recommended are: (i) NNFI >0.90 (Tabachnick & Fidell, 2001), (ii) CFI >0.95 (Hu & Bentler, 1995), and (iii) RMSEA $<0.l0$ (Browne & Cudeck, 1993).

10. To support discriminant validity, the variance extracted for each construct must exceed the squared correlations between latent constructs (Fornell & Larcker, 1981).

11. The input matrices are available from the authors upon request.

12. See Footnotes 7–10 for the threshold values used to assess the validity of the results.

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APPENDIX A. RELIABILITY AND VALIDITY OF QUESTIONNAIRE ITEMS

I: Pressures

Perceived environmental uncertainty (PEU)

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Competitors' actions are highly unpredictable.	0.521**	0.271	–	–
Client demand for products/ services is highly unpredictable.	0.561**	0.315	–	–
Regulations are highly unpredictable.	0.341**	0.116	–	–
Competition for prices is highly intensive.	0.693**	0.480	0.802**	0.643
Competition for products/services (attributes, design) is highly intensive.	0.747**	0.558	0.874**	0.764
Regulations are highly intensive.	0.153**	0.023	–	–
Differences in competitive tactics require original marketing, production (if applicable) and administrative practices.	0.759**	0.576	0.586**	0.343
Differences in client tastes require original marketing, production (if applicable) and administrative practices.	0.791**	0.626	0.634**	0.402
Goodness-of-fit of the model:	$\chi^2 (20) = 134.27$, $p < 0.001$; NNFI = 0.780; CFI = 0.843; RMSEA = 0.179		$\chi^2 (1) = 1.01$, $p = 0.314$; NNFI = 1.0; CFI = 1.0; RMSEA = 0.008	
Cronbach's α:	0.805		0.843	
Composite reliability:	0.806		0.819	
Variance extracted:	0.371		0.538	

APPENDIX A.   (*Continued*)

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2

Stakeholder orientation

The following groups are explicitly referred to in the corporate mission or vision:

Shareholders/investors	0.647**	0.419	–	–
Clients	0.612**	0.375	–	–
Employees	0.769**	0.591	–	–
Suppliers	0.641**	0.411	–	–
Governments/political groups	0.549**	0.301	–	–
Public at large	0.618**	0.382	–	–
Goodness-of-fit of the model:	$\chi^2 (8) = 28.29$, $p = 0$; NNFI = 0.920; CFI = 0.957; RMSEA = 0.119		–	
Cronbach's α:	0.811			
Composite reliability:	0.807			
Variance extracted:	0.413			

II: Management Control Package Related to Web Site Content

Decentralization

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Involvement of the following groups[a] in writing the information content (development, quality control).	0.901**	0.812	–	–
Involvement of the following groups[a] in delivering the information content online (display, removal, quality control).	0.854**	0.729	–	–
Involvement of the following groups[a] in improving the Web site (major changes or redesign).	0.776**	0.602	–	–

APPENDIX A. (*Continued*)

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Goodness-of-fit of the model:	$\chi^2 (0) = 0$, $p = 0$; (saturation); NNFI = 1.0; CFI = 1.0; RMSEA = 0		–	
Cronbach's α:	0.880			
Composite reliability:	0.882			
Variance extracted:	0.714			

[a]Mean of marketing, communications, technology/IT, multidisciplinary Internet team, finance/administration, various business units/subsidiaries, top management, clients, external consultants; groups added for the third question: community representatives, external auditors, internal auditors, members of the board of directors.

Standardization

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Roles and responsibilities of internal parties involved' are defined.	0.588**	0.346	0.562**	0.316
Groups of internal parties involved share common vision of how information content is managed.	0.643**	0.413	0.591**	0.349
Procedures (formal or informal) exist to facilitate the settlement of conflicts between groups involved in the management of the information content.	0.767**	0.588	0.679**	0.461
Procedures (formal or informal) have been put in place for all situations dealing with the management of the information content.	0.803**	0.645	0.750**	0.563
Existing procedures are usually in writing.	0.647**	0.419	0.737**	0.543
Informal agreements are reached to handle situations.	0.486**	0.236	–	–
Informal steps (ad hoc committee, interorganizational discussions, seminars, etc.) can be at the origin of changes to information.	0.355**	0.126	–	–

APPENDIX A.   (*Continued*)

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Goodness-of-fit of the model:	χ^2 (14) = 131.73, $p < 0.001$; NNFI = 0.697; CFI = 0.798; RMSEA = 0.217		χ^2 (3) = 6.63, $p = 0.085$; NNFI = 0.971; CFI = 0.991; RMSEA = 0.082	
Cronbach's α:	0.814		0.827	
Composite reliability:	0.813		0.799	
Variance extracted:	0.396		0.447	

Planning

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Strategic decisions about information reporting on the Internet are incorporated into the company's overall communication strategy.	0.668**	0.446	–	–
Strategic actions about information reporting on the Internet are coordinated with the company's overall communication strategy.	0.728**	0.530	–	–
Risks inherent in information reporting on the Internet are identified (e.g., lawsuit if information is wrong, providing strategic information to competitors).	0.754**	0.569	–	–
Actions are anticipated to manage those risks (e.g., evaluation procedures).	0.646**	0.417	–	–
The information needs of Internet users (shareholders, investors, clients, etc.) are anticipated on a long-term basis (over a year).	0.789**	0.623	–	–
Financial, human, and material resources are anticipated on a long-term basis.	0.790**	0.624	–	–
Goodness-of-fit of the model:	χ^2 (7) = 21.59, $p = 0.003$; NNFI = 0.965; CFI = 0.984; RMSEA = 0.108		–	

APPENDIX A.   (*Continued*)

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Cronbach's α:	0.891			
Composite reliability:	0.872			
Variance extracted:	0.535			

Monitoring

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Periodic evaluations are done (weekly, monthly or quarterly).	0.451**	0.203	–	–
Quality evaluation is currently based on:				
A comparison with the web sites of competitors.	0.379**	0.144	–	–
A comparison with the web site of leaders in information reporting on the Internet.	0.545**	0.297	–	–
Surveys on company web site user satisfaction.	0.758**	0.575	0.810**	0.656
Tests using the company's web site.	0.573**	0.328	0.566**	0.320
Focus group's discussion results.	0.578**	0.334	0.679**	0.461
Feedback obtained via e-mail.	0.496**	0.246	–	–
Number of visitors on each web site section.	0.669**	0.448	0.588**	0.346
External consultants' opinion.	0.291**	0.085	–	–
Fall out reports (specify where on a web page Internet user has given up visiting the site or completing an application online).	0.604**	0.365	0.567**	0.321
Goodness-of-fit of the model:	$\chi^2 (35) = 137.73$, $p = 0$; NNFI = 0.813; CFI = 0.855; RMSEA = 0.128		$\chi^2 (3) = 9.56$, $p = 0.0227$; NNFI = 0.929; CFI = 0.979; RMSEA = 0.111	
Cronbach's α:	0.799		0.775	
Composite reliability:	0.804		0.781	
Variance extracted:	0.302		0.421	

III: Web Site Content

Quality of information

Items	Initial Model		Respecified Model	
	Standardized loadings	R^2	Standardized loadings	R^2
Type of information (mean of business information, financial information, nonfinancial information, promotional information, transactional information).	0.572**	0.327	–	–
General form of information (graphics, audio, video, etc.).	0.708**	0.501	–	–
User-friendliness to access information (navigation aids, user needs headings, external/internal links, etc.).	0.794**	0.630	–	–
Information content taken as a whole.	0.569**	0.324	–	–
Goodness-of-fit of the model:	$\chi^2 (2) = 0.59, p = 0.743$; NNFI = 1.0; CFI = 1.0; RMSEA = 0		–	
Cronbach's α:	0.743			
Composite reliability:	0.759			
Variance extracted:	0.446			

*Significant at the 0.05 level; **Significant at the 0.01 level.

APPENDIX B. LIST OF 132 ITEMS COMPRISING THE CONTENT INDEX

Financial content

1–4	Quarterly reports, annual reports: current year, past year
5	Annual information/proxy circular
6–9	Stock quote on the Web site of the organization: online, current year, history/past year, compared to financial index
10–13	Key ratios, financial data summary: current and past year, more than 2 years
14	Credit rating
15	Value creation

16	Management discussion and analysis
17–18	Prospective information, warning/limits
19–22	Conference calls, speeches, shareholders meeting, financial events calendar
23	Dividend reinvestment program
24–26	Financial analysts: list, recommendations, forecast
27–28	External links: SEDAR/EDGAR, stock quotes

Nonfinancial content

General

29	Periodic general information
30–32	Profile, history, portfolio/affiliated
33	Promotional/social calendar
34–35	Press releases: current year, past year
36–38	Web pages and web site updating dates, legal considerations
39	External link: "newswire"

Corporate governance

40–41	Mission statement, strategic planning
42	Regulation (SOX, NYSE, TSE, etc.)
43	Risk management
44	Governance guidelines
45	Globalization/internationalization
46	Managers/members of board of directors list
47	Role and responsibilities of president (board of directors, committees, chief executive officer)
48–49	Competence, compensation management
50–54	Competence, recruitment/evaluation, compensation, independence, mandate board of directors
55–56	Board of directors committees, mandate/role and responsibilities
57	Stock option plan
58	Comments to board of directors
59–61	Whistle-blowing policy, insider trading policy, disclosure policy
62–63	Important contract, auditors' fee
64	Shareholders meeting results
65	Code of ethics/code of conduct
66	Ownership/majority shareholders

Operations/development

67–68	Operation periodic data, annual data
69–76	Productivity: costs, capacity, wasting/recovery, inventory, quality of equipment/raw material/technology, flexibility, description of process, time
77–78	Certification ISO/other certification, strategic alliances
79–80	Distribution: network, strategic alliances
81	Future/growing strategy/innovation/development projects
82–87	Increase in sales/market, increase in investments, investments (amount−% sales)/importance of R&D, description of products/services in development, tests/feasibility study/ exploration, strategic alliances
88–89	Future/tendencies (industry/market), industry data
90	External link: associations/governments/affiliated

Social responsibility

91	Purchase products/services
92–94	Program: employment, equity, development of human capital
95–96	Security at work, security of products
97	Environment taken in consideration in organizational operations
98–101	Economic/regional development, community, donations, strategic alliances

Human capital

102–105	Competence: hiring new employees, qualifications, expertise in general, training in general
106–112	Motivation: participation, creativity, teamwork, performance evaluation, compensation based on performance, social benefits, development
113–114	Satisfaction, retention

Products/services/clients

115	Number/profile/segment market
116–117	Pre-, after-sales services
118–119	Satisfaction, loyalty
120	Summary description products/services

Promotional content

121	Detailed description of products/services
122	Quality finished product/service
123–124	Conditions: price, reliability
125	Delivery time

Transactional content (electronic commerce)

126	Order products/ask for services
127	Online service
128	Quality/distinction online services
129–132	Conditions: security, payment, price, delivery time

APPENDIX C. DESCRIPTIVE STATISTICS AND CORRELATION MATRIX
($n = 180$)

	1	2	3	4	5	6	7	8	9
Descriptive statistics									
No. of items used	4	6	3	5	6	5	1	4	4
Theoretical range	1–7	1–7	1–7	1–7	1–7	1–7	1–132	1–7	–
Minimum	1	1	1	1	1	1	12	1.8	8.48
Maximum	7	7	7	7	7	7	87	6.95	16.04
Mean	4.53	3.90	3.05	3.77	4.71	2.95	44.64	4.69	11.77
Standard deviation	1.58	1.62	0.87	1.57	1.58	1.39	15.99	1.01	1.67
Median	5.00	4.17	2.97	3.80	5.08	2.80	43.00	4.75	11.62
Correlation matrix (Pearson)									
PEU	1.0								
Stakeholder orientation	0.21**	1.0							
Decentralization	0.38**	0.26**	1.0						
Standardization	0.25**	0.25**	0.48**	1.0					
Planning	0.13	0.19**	0.39**	0.48**	1.0				
Monitoring	0.12	0.23**	0.44**	0.40**	0.39**	1.0			
Quantity of web site content	−0.09	0.08	0.27**	0.36**	0.31**	0.31**	1.0		
Quality of web site content	0.14	0.29**	0.38**	0.43**	0.31**	0.39**	0.27**	1.0	

*Significant at the 0.05 level; **Significant at the 0.01 level.