

Managerial **Accounting**



Managerial Accounting

NINTH EDITION

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Managerial Accounting

NINTH EDITION

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Accounting in Motion!

This revision of *Managerial Accounting* is based on an understanding of the nature, culture, and motivations of today’s undergraduate students and on extensive feedback from many instructors who use our book. These substantial changes meet the needs of these students, who not only face a business world increasingly complicated by ethical issues, globalization, and technology but who also have more demands on their time. To assist them to meet these challenges, the authors carefully show them how the effects of business transactions, which are the result of business decisions, are recorded in a way that will be reflected on the financial statements. Instructors will find that building on the text’s historically strong pedagogy, the authors have strengthened transaction analysis and its link to the accounting cycle.

Updated Content, Organization and Pedagogy

Strong Pedagogical System

Managerial Accounting originated the pedagogical system of *Integrated Learning Objectives*. The system supports both learning and teaching by providing flexibility in support of the instructor’s teaching of first-year accounting. The chapter review and all assignments identify the applicable learning objective(s) for easy reference.

Each learning objective refers to a specific content area, usually either conceptual content or procedural techniques, in short and easily understandable segments. Each segment is followed by a “**Stop and Apply**” section that illustrates and solves a short exercise related to the learning objective.

STOP

& APPLY >

Match the letter of each item below with the numbers of the related items:

a. An inventory cost	___	3. Application of the LCM rule
b. An assumption used in the valuation of inventory	___	4. Goods flow
c. Full disclosure convention	___	5. Transportation charge for merchandise shipped FOB shipping point
d. Conservatism convention	___	6. Cost flow
e. Consistency convention	___	7. Choosing a method and sticking with it
f. Not an inventory cost or assumed flow	___	8. Transportation charge for merchandise shipped FOB destination
___ 1. Cost of consigned goods		
___ 2. A note to the financial statements explaining inventory policies		

SOLUTION
1. f; 2. c; 3. d; 4. b; 5. a; 6. f; 7. e; 8. f

To make the text more visually appealing and readable, it is divided into student-friendly sections with brief bulleted lists, new art, photographs, and end-of-section review material.

Cash Flows and the Timing of Transactions

LO5 Show how the timing of transactions affects cash flows and liquidity.



To avoid financial distress, a company must be able to pay its bills on time. Because the timing of cash flows is critical to maintaining adequate liquidity to pay bills, managers and other users of financial information must understand the difference between transactions that generate immediate cash and those that do not. Consider the transactions of Miller Design Studio shown in Figure 2-3. Most of them involve either an inflow or outflow of cash.

As you can see in Figure 2-3, Miller's Cash account has more transactions than any of its other accounts. Look at the transactions of July 10, 15, and 22:

- ▶ July 10: Miller received a cash payment of \$2,800.
- ▶ July 15: The firm billed a customer \$9,600 for a service it had already performed.
- ▶ July 22: The firm received a partial payment of \$5,000 from the customer, but it had not received the remaining \$4,600 by the end of the month.

Because Miller incurred expenses in providing this service, it must pay careful attention to its cash flows and liquidity.

One way Miller can manage its expenditures is to rely on its creditors to give it time to pay. Compare the transactions of July 3, 5, and 9 in Figure 2-3.

Study Note

After Step 1 has been completed, the Income Summary account reflects the account balance of the Design Revenue account before it was closed.

Further, to reduce distractions, the margins of the text include only **Study Notes**, which alert students to common misunderstandings of concepts and techniques; key ratio and cash flow icons, which highlight discussions of profitability and liquidity; and accounting equations.

In this edition, we reduced excessive detail, shortened headings, simplified explanations, and increased readability in an effort to reduce the length of each chapter.

Enhanced Real-World Examples Demonstrate Accounting in Motion

IFRS, Fair Value, and Other Updates

International Financial Reporting Standards and fair value have been integrated throughout the book where accounting standards have changed and also in the **Business Focus** features where applicable. All current events, statistics, and tables have been updated with the latest data.



FOCUS ON BUSINESS PRACTICE

IFRS

IFRS: The Arrival of International Financial Reporting Standards in the United States

Over the next few years, international financial reporting standards (IFRS) will become much more important in the United States and globally. The International Accounting Standards Board (IASB) has been working with the Financial Accounting Standards Board (FASB) and similar boards in other nations to achieve identical or nearly identical standards worldwide. IFRS are now required in many parts of the world, including Europe. The Securities- and Exchange Commission (SEC) recently voted to allow foreign registrants in the United States. This is a major development because in the past, the SEC required foreign registrants to explain how the standards used in their statements differed from U.S. standards. This change affects approximately 10 percent of all public U.S. companies. In addition, the SEC may in the near future allow U.S. companies to use IFRS.¹¹

Use of Diverse Companies

Each chapter begins with a **Decision Point**, a real-world scenario about a company that challenges students to see the connection between accounting information and management decisions.

**DECISION POINT ▶ A USER'S FOCUS
THE BOEING COMPANY**

▶ An order for airplanes is obviously an important economic event for both the buyer and the seller. Is there a difference between an economic event and a business transaction that should be recorded in the accounting records?

▶ Should Boeing record the order in its accounting records?

▶ How important are liquidity and cash flows to Boeing?

In April 2006, the Chinese government announced that it had ordered 80 **Boeing** commercial jet liners, thus fulfilling a commitment it had made to purchase 150 airplanes from Boeing. Valued at about \$4.6 billion, the order for the 80 airplanes was one of many events that brought about Boeing's resurgence in the stock market. After Boeing received this order, as well as orders from other customers, its stock began trading at an all-time high.

Typically, it takes Boeing almost two years to manufacture an airplane. In this case, the aircraft delivery cycle was expected to peak in 2009.¹


These company examples come full circle at the end of the chapter by linking directly to the **A Look Back At** diverse company examples illustrate accounting concepts and encourage students to apply what they have learned.

A LOOK BACK AT ▶ THE BOEING COMPANY

The Decision Point at the beginning of the chapter described the order for 80 airplanes that the Chinese government placed with **Boeing**. It posed the following questions:

- An order for airplanes is obviously an important economic event to both the buyer and the seller. Is there a difference between an economic event and a business transaction that should be recorded in the accounting records?
- Should Boeing record the order in its accounting records?
- How important are liquidity and cash flows to Boeing?

Despite its importance, the order did not constitute a business transaction, and neither the buyer nor the seller should have recognized it in its accounting records. At the time the Chinese government placed the order, Boeing had not yet built the airplanes. Until it delivers them and title to them shifts to the Chinese government, Boeing cannot record any revenue.



Use of Well-Known Public Companies

This textbook also offers examples from highly recognizable public companies, such as CVS Caremark, Southwest Airlines, Dell Computer, and Netflix, to relate basic accounting concepts and techniques to the real world. The latest available data is used in exhibits to incorporate the most recent FASB pronouncements. The authors illustrate current practices in financial reporting by referring to data from *Accounting Trends and Techniques* (AICPA) and integrate international topics wherever appropriate.

CVS Caremark Corporation Consolidated Statements of Operations			
		Fiscal Year Ended	
		Dec. 31, 2008 (52 weeks)	Dec. 29, 2007 (52 weeks)
		Dec. 30, 2006 (53 weeks)	
<i>(In millions, except per share amounts)</i>			
Net revenues		\$87,471.9	\$76,329.5
Cost of revenues		69,181.5	60,221.8
Gross profit		18,290.4	16,107.7
Total operating expenses		12,244.2	11,314.4
Operating profit ¹		6,046.2	4,793.3
Interest expense, net ²		509.5	434.6
Earnings before income tax provision		5,536.7	4,358.7
Loss from discontinued operations, net of income tax benefit of \$82.4		(132)	—
Income tax provision		2,192.6	1,721.7
Net earnings ³		3,212.1	2,637.0
Preference dividends, net of income tax benefit ⁴		14.1	14.2
Net earnings available to common shareholders		\$ 3,198.0	\$ 2,622.8
BASIC EARNINGS PER COMMON SHARE: ⁵			
Net earnings		\$ 2.23	\$ 1.97
Weighted average common shares outstanding		1,433.5	1,328.2
DILUTED EARNINGS PER COMMON SHARE:			
Net earnings		\$ 2.18	\$ 1.92
Weighted average common shares outstanding		1,469.1	1,371.8

Revised and Expanded Assignments

Assignments have been carefully scrutinized for direct relevancy to the learning objectives in the chapters. Names and numbers for all Short Exercises, Exercises, and Problems have been changed except those used on videos. We have reversed the alternate and main problems from the previous edition. Most importantly, alternative problems have been expanded so that there are ample problems for any course.

All of the cases have been updated as appropriate and the number of cases in each chapter has been reduced in response to user preferences. The variety of cases in each chapter depends on their relevance to the chapter topics, but throughout the text there are cases involving conceptual understanding, ethical dilemmas, interpreting financial reports, group activities, business communication, and the Internet. Annual report cases based on CVS Caremark and Southwest Airlines can be found at the end of the chapter.

Specific Chapter Changes

The following chapter-specific changes have been made in this edition of *Managerial Accounting*:

Chapter 1 The Changing Business Environment: A Manager's Perspective

- Updated definition of management accounting in LO1
- *Lean production* introduced as a key term in LO3
- Sections on total quality management and activity based management in LO3 revised
- Updated Focus on Business Practice box on how to blow the whistle on fraud

Chapter 2 Cost Concepts and Cost Allocation

- New company (Hershey's) used as example in the Decision Point
- Discussions of costs in LO2 in previous edition incorporated in LO1
- Introduction to methods of product cost measurement added and section on computing service unit cost shortened in new LO4
- LO7 and LO8 in previous edition (the traditional and ABC approaches to allocating overhead) streamlined and incorporated in new LO5

Chapter 3 Costing Systems: Job Order Costing

- Chapter 3 in previous edition separated into two chapters, with new Chapter 3 focusing on job order costing and new Chapter 4 focusing on process costing
- *Operations costing system* introduced as a key concept
- Discussions of manufacturer's job order cost card, computation of unit cost, and job order costing in a service organization included in new LO4

Chapter 4 Costing Systems: Process Costing

- New chapter (part of Chapter 3 in previous edition)

Chapter 5 Value-Based Systems: ABM and Lean

- Chapter revised to emphasize value-based systems
- LO1, LO2, and LO3 in last edition revised and incorporated in new LO1
- New listing of the disadvantages of activity-based costing in LO2
- New focus on lean operations in LO3 and section on accounting for product costs added

Chapter 6 Cost Behavior Analysis

- New company (Flickr) used as example in the Decision Point
- Sections on variable, fixed, and mixed costs, which were in LO2 in last edition, now included in LO1
- Concept of a *step cost* introduced in discussion of fixed costs in LO1
- Methods used to separate the components of mixed costs and the contribution margin income statement now the focus of LO2
- Material in LO4 reformatted to clarify concepts

Chapter 7 The Budgeting Process

- New company (Framerica Corporation) used as example in the Decision Point
- LO1 reorganized, revised, and shortened
- Section on advantages of budgeting and three new key terms—*static budget*, *continuous budget*, and *zero-based budgeting* added to LO1

Chapter 8 Performance Management and Evaluation

- LO1 and LO2 in last edition combined and revised

Chapter 9 Standard Costing and Variance Analysis

- New company (iRobot Corporation) used as example in the Decision Point
- LO1 and LO2 in last edition combined and revised
- New Focus on Business Practice box titled “What Do You Get When You Cross a Vacuum Cleaner with a Gaming Console?”

Chapter 10 Short-Run Decision Analysis

- Chapter revised to focus on the use of incremental analysis in making short-run decisions; capital investment analysis and time value of money now covered in Chapter 11

Chapter 11 Capital Investment Analysis

- New chapter

Chapter 12 Pricing Decisions, Including Target Costing and Transfer Pricing

- LO1 reorganized and shortened
- Updated Focus on Business Practice box on Internet fraud
- Discussions of steps followed in gross margin pricing and return on assets pricing in LO3 reformatted for greater clarity
- Discussion of the differences between cost-based pricing and target costing in LO4 revised and made more succinct
- Section on developing a transfer price in LO5 revised

Chapter 13 Quality Management and Measurement

- In LO2, formula for computing delivery cycle time added and displayed; formula for computing waste time also displayed
- In LO4, discussion of Motorola's Sigma Six quality goal revised, with disadvantages noted

Chapter 14 Financial Analysis of Performance

- Section on the management process in LO1 revised to increase the focus on management's objectives
- Revised Focus on Business Practice box on pro forma earnings
- In LO3, two-year coverage of the comprehensive ratio analysis extended to three years
- Revised Focus on Business Practice box on performance measurement and management compensation

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Award. Active in many academic and professional organizations, he has served as the U.S. representative on several international accounting committees, including the Education Committee of the International Federation of Accountants (IFAC). He is currently vice president of education of the American Accounting Association.

Managerial Accounting

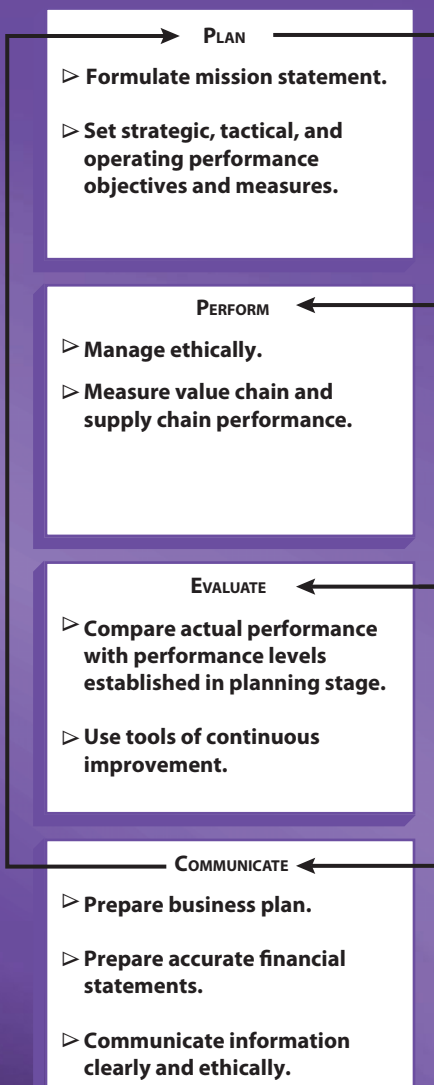
NINTH EDITION

CHAPTER

1

The Changing Business Environment: A Manager's Perspective

The Management Process



How managers plan, perform, evaluate, and report business can affect us all.

Management is expected to ensure that the organization uses its resources wisely, operates profitably, pays its debts, and abides by laws and regulations. To fulfill these expectations, managers establish the goals, objectives, and strategic plans that guide and control the organization's operating, investing, and financing activities. In this chapter, we describe the approaches that managers have developed to meet the challenges of today's changing business environment and the role that management accounting plays in meeting those challenges in an ethical manner.

LEARNING OBJECTIVES

- L01** Distinguish management accounting from financial accounting and explain how management accounting supports the management process. (pp. 4–11)
- L02** Describe the value chain and its usefulness in analyzing a business. (pp. 11–15)
- L03** Identify the management tools used for continuous improvement. (pp. 15–19)
- L04** Explain the balanced scorecard and its relationship to performance measures. (pp. 19–22)
- L05** Identify the standards of ethical conduct for management accountants. (pp. 22–24)

DECISION POINT ▶ A MANAGER'S FOCUS WAL-MART STORES, INC.

If organizations are to prosper, they must identify the factors that are critical to their success. Key success factors include:

- ▶ satisfying customer needs,
- ▶ developing efficient operating processes,
- ▶ fostering career paths for employees, and
- ▶ being an innovative leader in marketing products and services.

Wal-Mart's managers balance these factors when they plan, perform, evaluate, and report on their company's success. Wal-Mart's long-time leader, Lee Scott, summed up his company's strategy this way: "What we look at is, when you end the year, did you produce the record results you wanted and are you positioned to do that again next year?"¹

- ▶ What is Wal-Mart's strategic plan?
- ▶ What management accounting tools does Wal-Mart use to stay ahead of its competitors?
- ▶ What role does management accounting play in Wal-Mart's endeavors?



The Role of Management Accounting

LO1 Distinguish management accounting from financial accounting and explain how management accounting supports the management process.

To plan and control an organization's operations, to measure its performance, and to make decisions about products or services and many other internal control and governance matters, managers need accurate and timely accounting information. The role of management accounting is to provide an information system that enables managers and persons throughout an organization:

- ▶ to make informed decisions,
- ▶ to be more effective at their jobs, and
- ▶ to improve the organization's performance.

In 2008, the Institute of Management Accountants (IMA) updated the definition of **management accounting** as follows:

Management accounting is a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy.²

This definition recognizes that regulation, globalization, and technology changes have redefined the management accountant's role from a traditional compliance, number-focused one to that of a strategic business partner within an organization. Thus, the importance of nonfinancial information has increased significantly. Today, management accounting information includes nonfinancial data as well as financial data in performance management, planning and budgeting, corporate governance, risk management, and internal controls.

Management Accounting and Financial Accounting: A Comparison

Both management accounting and financial accounting assist decision makers by identifying, measuring, and processing relevant information and communicating this information through reports. Both provide managers with key measures of a company's performance and with cost information for valuing inventories on the balance sheet. Despite the overlap in their functions, management accounting and financial accounting differ in a number of ways. Table 1-1 summarizes these differences.

The primary users of management accounting information are people inside the organization, whereas financial accounting takes the actual results of management decisions about operating, investing, and financing activities and prepares financial statements for parties outside the organization—owners or stockholders, lenders, customers, and governmental agencies. Although these reports are prepared primarily for external use, managers also rely on them in evaluating an organization's performance.

Because management accounting reports are for internal use, their format can be flexible, driven by the user's needs. They may report either historical or future-oriented information without any formal guidelines or restrictions. In contrast, financial accounting reports, which focus on past performance, must follow generally accepted accounting principles as specified by the Securities and Exchange Commission (SEC).

The information in management accounting reports may be objective and verifiable, expressed in monetary terms or in physical measures of time or objects; the information may be based on estimates, and in such cases, it will be more subjective. In contrast, the statements that financial accounting provides must be based on objective and verifiable information, which is generally historical in nature and measured in monetary terms. Management accounting reports are

Study Note

Management accounting is *not* a subordinate activity to financial accounting. Rather, it is a process that includes financial accounting, tax accounting, information analysis, and other accounting activities.

Study Note

Financial accounting must adhere to the conventions of consistency and comparability to ensure the usefulness of information to parties outside the firm. Management accounting, on the other hand, can use innovative analyses and presentation techniques to enhance the usefulness of information to people within the firm.

TABLE 1-1 Comparison of Management Accounting and Financial Accounting

Areas of Comparison	Management Accounting	Financial Accounting
Primary users	Managers, employees, supply-chain partners	Owners or stockholders, lenders, customers, governmental agencies
Report format	Flexible, driven by user's needs	Based on generally accepted accounting principles
Purpose of reports	Provide information for planning, control, performance measurement, and decision making	Report on past performance
Nature of information	Objective and verifiable for decision making; more subjective for planning (relies on estimates); confidential and private	Objective and verifiable; publicly available
Units of measure	Monetary at historical or current market or projected values; physical measures of time or number of objects	Monetary at historical and current market values
Frequency of reports	Prepared as needed; may or may not be on a periodic basis	Prepared on a periodic basis

prepared as often as needed—annually, quarterly, monthly, or even daily. Financial statements, on the other hand, are prepared and distributed periodically, usually on a quarterly and annual basis.

Management Accounting and the Management Process

Although management actions differ from organization to organization, they generally follow a four-stage management process. As illustrated at the beginning of this chapter and in the chapters that follow, the four stages of this process are:

- ▶ planning,
- ▶ performing,
- ▶ evaluating, and
- ▶ communicating.

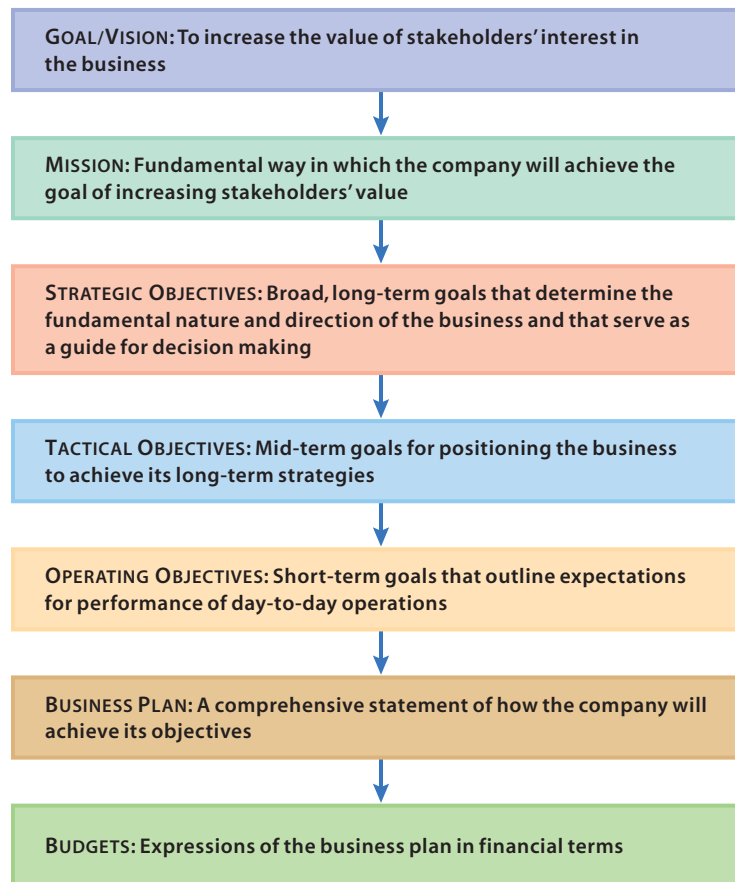
Management accounting is essential in each stage of the process as managers make business decisions.

Planning Figure 1-1 shows the overall framework in which planning takes place. The overriding goal of a business is to increase the value of the stakeholders' interest in the business. The goal specifies the business's end point, or ideal state. For example, **Wal-Mart's** end point is "to become the worldwide leader in retailing."

A company's **mission statement** describes the fundamental way in which the company will achieve its goal of increasing stakeholders' value. It also expresses the company's identity and unique character. Wal-Mart's mission statement says that it wants "to give ordinary folk the chance to buy the same things as rich people."

The mission statement is essential to the planning process, which must consider how to add value through strategic objectives, tactical objectives, and operating objectives.

FIGURE 1-1
Overview of the Planning Framework



- ▶ **Strategic objectives** are broad, long-term goals that determine the fundamental nature and direction of a business and that serve as a guide for decision making. Strategic objectives involve such basic issues as what a company's main products or services will be, who its primary customers will be, and where it will operate. They stake out the strategic position that a company will occupy in the market—whether it will be a cost leader, quality leader, or niche satisfier. Wal-Mart's *The Company of the Future: Fact Sheet*³ lays out three issues Wal-Mart will focus on in the future: health care, energy efficiency, and ethical sourcing. For healthcare, the stated strategic goal is that every American should have access to quality affordable health care. Notice how this goal stakes out Wal-Mart's position as the low cost leader in health care.
- ▶ **Tactical objectives** are mid-term goals that position an organization to achieve its long-term strategies. These objectives, which usually cover a three- to five-year period, lay the groundwork for attaining the company's strategic objectives. To implement its health care strategy, Wal-Mart is working with physicians and other providers to increase electronic prescriptions, is providing electronic health records to its employees and their families, and is contracting with other firms to manage their prescription benefit programs.
- ▶ **Operating objectives** are short-term goals that outline expectations for the performance of day-to-day operations. Operating objectives link to performance targets and specify how success will be measured. Wal-Mart's operating objectives for health care include: increasing the number of electronic prescriptions filled to 8 million by the end of 2008, providing private health records to all past and current employees and their families by 2010, and saving other companies more than \$100 million in prescription benefit costs.

These health care objectives are in addition to Wal-Mart's central focus on increasing sales, earnings per share, and real profit dollars everyday—as evidenced by the daily posting of the company's stock price in every store.

To develop strategic, tactical, and operating objectives, managers must formulate a business plan. A **business plan** is a comprehensive statement of how a company will achieve its objectives. It is usually expressed in financial terms in the form of budgets, and it often includes performance goals for individuals, teams, products, or services.

EXAMPLE. Let's suppose that Vanna Lang is about to open a retail grocery store called Good Foods Store. Lang's goal is to obtain an income from the business and to increase the value of her investment in it. After reading about how traditional grocers are being squeezed out by low-cost competitors like **Wal-Mart** and quality-focused stores like **Whole Foods Market**, Lang has made the following decisions about Good Foods Store:

- ▶ Good Foods Store's mission is to attract upscale customers and retain them by selling high-quality foods and providing excellent service in a pleasant atmosphere.
- ▶ Lang's strategic objectives call for buying high-quality fresh foods from local growers and international distributors and reselling these items to consumers.
- ▶ Her tactical objectives include implementing a stable supply chain of high-quality suppliers and a database to track customers' preferences.
- ▶ Her operating objectives call for courteous and efficient customer service. To measure performance in this area, she decides to keep a record of the number and type of complaints about poor customer service.

Before Lang can open her store, she needs to apply to a local bank for a start-up loan. To do so, she must have a business plan that provides a full description of the business, including a complete operating budget for the first two years of operations. The budget must include a forecasted income statement, a forecasted statement of cash flows, and a forecasted balance sheet for both years.

Because Lang does not have a financial background, she consults a local accounting firm for help in developing her business plan. To provide relevant input for the plan, she has to determine the types of products she wants to sell; the volume of sales she anticipates; the selling price for each product; the monthly costs of leasing or purchasing facilities, employing personnel, and maintaining the facilities; and the number of display counters, storage units, and cash registers that she will need.



FOCUS ON BUSINESS PRACTICE

What's Going on in the Grocery Business?

Sales at large supermarket chains, such as **Kroger**, **Safe-way**, and **Albertson's**, have been flat and profits weak because both ends of their customer market are being squeezed. Large-scale retailers like **Wal-Mart** and **Costco** are attracting cost-conscious grocery shoppers, and upscale grocery customers are being lured to specialty grocers like **Trader Joe's** and **Whole Foods Market**. Albertson's

strategy to combat its flat sales and profits was to sell itself to other retailers, like **Supervalu** and **CVS**, to form larger businesses. Other grocery chains are reconsidering their company's mission and strategic options by adding new products and services, such as walk-in medical clinics, closing stores and downsizing, or entering new geographic markets.⁴

Performing Planning alone does not guarantee satisfactory operating results. Management must implement the business plan in ways that make optimal use of available resources in an ethical manner. Smooth operations require one or more of the following:

- ▶ Hiring and training personnel
- ▶ Matching human and technical resources to the work that must be done
- ▶ Purchasing or leasing facilities
- ▶ Maintaining an inventory of products for sale
- ▶ Identifying operating activities, or tasks, that minimize waste and improve the quality of products or services

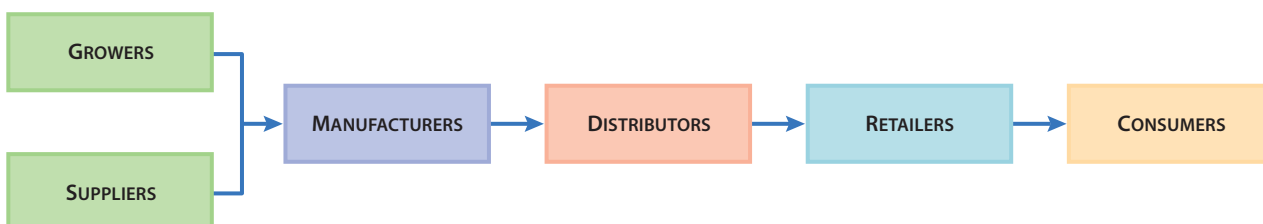
Managers execute the business plan by overseeing the company's daily operations. In small companies like Vanna Lang's, managers generally have frequent direct contact with their employees. They supervise them and interact with them to help them learn a task or improve their performance. In larger, more complex organizations, there is usually less direct contact between managers and employees. Instead of directly observing employees, managers in large companies like **Wal-Mart** monitor their employees' performance by measuring the time taken to complete an activity (such as how long it takes to process customer sales) or the frequency of an activity (such as the number of customers served per hour).

Critical to managing any retail business is a thorough understanding of its supply chain. As Figure 1-2 shows, the **supply chain** (also called the *supply network*) is the path that leads from the suppliers of the materials from which a product is made to the final consumer. In the supply chain for grocery stores, food and other items flow from growers and suppliers to manufacturers or distributors to retailers to consumers. The supply chain expresses the links between businesses—growers to vendors to the business to their customers.

EXAMPLE. Let's assume that Good Foods Store is now open for business. The budget prepared for the store's first two years of operation expresses in monetary terms how the business plan should be executed. Items that relate to the business plan appear in the budget and become authorizations for expenditures. They include such matters as spending on store fixtures, hiring employees, developing advertising campaigns, and pricing items for special sales. Lang's knowledge of her supply chain allows her to coordinate deliveries from local growers and international distributors so that she meets the demands of her customers without having too much or too little inventory on hand.

Evaluating When managers evaluate operating results, they compare the organization's actual performance with the performance levels they established in the planning stage. They earmark any significant variations for further analysis so that they can correct the problems. If the problems are the result of a change in the organization's operating environment, the managers may revise the original

FIGURE 1-2 The Supply Chain



The supply chain is the path that links producers to stores to the final consumer. In the supply chain for grocery stores, fruits and vegetables flow from growers and suppliers to manufacturers or distributors to retailers to consumers. The supply chain for this farmer's market is much shorter: grower to consumer.

Courtesy of Vasiliki/iStockphoto.



objectives. Ideally, the adjustments made in the evaluation stage will improve the company's performance.

EXAMPLE. To evaluate how well Good Foods Store is doing, Vanna Lang will compare the amounts estimated in the budget with actual results. If any differences appear, she will analyze why they have occurred. The reasons for these differences may lead Lang to change parts of her original business plan. In addition to reviewing employees' performance with regard to financial goals, such as avoiding waste, Lang will want to review how well her employees served customers. As noted earlier, she decided to monitor service quality by keeping a record of the number and type of complaints about poor customer service. Her review of this record may help her develop new and better strategies.

Communicating Whether accounting reports are prepared for internal or external use, they must provide accurate information and clearly communicate this information to the reader. Inaccurate or confusing internal reports can have



FOCUS ON BUSINESS PRACTICE

What Is Management's Responsibility for the Financial Statements?

Top-level managers have not only an ethical responsibility to ensure that the financial statements issued by their companies adhere to the principles of full disclosure and transparency; today, they have a legal responsibility as well. The Securities and Exchange Commission (SEC) requires the chief executive officers and chief financial officers of

companies filing reports with the SEC to certify that those reports contain no untrue statements and include all facts needed to ensure that the reports are not misleading. In addition, the SEC requires managers to ensure that the information in reports filed with the SEC "is recorded, processed, summarized and reported on a timely basis."⁵

a negative effect on a company's operations. Full disclosure and transparency in financial statements issued to external parties is a basic concept of generally accepted accounting principles, and violation of this principle can result in stiff penalties. After the reporting violations by **Enron**, **WorldCom**, and other companies, Congress passed legislation that requires the top management of companies that file financial statements with the Securities and Exchange Commission to certify that these statements are accurate. The penalty for issuing false public reports can be loss of compensation, fines, and jail time.

The key to producing accurate and useful internal and external reports whose meaning is transparent to the reader is to apply the four *w*'s: why, who, what, and when.

- ▶ **Why?** Know the purpose of the report. Focus on it as you write.
- ▶ **Who?** Identify the audience for your report. Communicate at a level that matches your readers' understanding of the issue and their familiarity with accounting information. A detailed, informal report may be appropriate for your manager, but a more concise summary may be necessary for other audiences, such as the president or board of directors of your organization.
- ▶ **What?** What information is needed, and what method of presentation is best? Select relevant information from reliable sources. You may draw information from pertinent documents or from interviews with knowledgeable managers and employees. The information should be not only relevant but also easy to read and understand. You may need to include visual aids, such as bar charts or graphs, to present the information clearly.
- ▶ **When?** Know the due date for the report. Strive to prepare an accurate report on a timely basis. If the report is urgently needed, you may have to sacrifice some accuracy in the interest of timeliness.

EXAMPLE. Assume that Vanna Lang has asked her company's accountant, Sal Chavez, to prepare financial statements and internal reports. In the financial statements that are prepared:

- ▶ The purpose—or *why*—is to report on the financial health of Good Foods Store.
- ▶ Lang, her bank and other creditors, and potential investors are the *who*.
- ▶ The *what* consists of disclosures about assets, liabilities, product costs, and sales.
- ▶ The required reporting deadline for the accounting period answers the question of *when*.

Lang will also want periodic internal reports on various aspects of her store's operations. For example, a monthly report may summarize the costs of ordering products from international distributors and the related shipping charges. If the costs in the monthly reports appear to be too high, she may ask for a special study. The results of such a study might result in a memorandum report like the one shown in Exhibit 1-1.

In summary, management accounting can provide a constant stream of relevant information. Compare Lang's activities and information needs with the plan, perform, evaluate, and communicate steps of the management process. She started with a business plan, implemented the plan, and evaluated the results. Accounting information helped her develop her business plan, communicate that plan to her bank and employees, evaluate the performance of her employees, and report the results of operations. As you can see, accounting plays a critical role in managing the operations of any organization.

EXHIBIT 1-1

A Management Accounting Report

Memorandum

When: Today's Date

Who: To: V. Lang, Good Foods Store

From: Sal Chavez, Accountant

Why: Re: International Distributors Ordering and Shipping Costs—Analysis and Recommendations

What: As you requested, I have analyzed the ordering and shipping costs incurred when buying from international distributors. I found that during the past year, these costs were 9 percent of sales, or \$36,000. On average, we are placing about two orders per week, or eight orders per month. Placing each order requires about two and one-half hours of an employee's time. Further, the international distributors charge a service fee for each order, and shippers charge high rates for orders as small as ours.

My recommendations are (1) to reduce orders to four per month (the products' freshness will not be affected if we order at least once a week) and (2) to begin placing orders through the international distributors' websites (our international distributors do not charge a service fee for online orders). If we follow these recommendations, I project that the costs of receiving products will be reduced to 4 percent of sales, or \$16,000, annually—a savings of \$20,000.

STOP & APPLY >

Indicate whether each of the following characteristics relates to management accounting (MA) or financial accounting (FA):

- | | |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 1. Focuses on various segments of the business entity | 5. Reports information on a regular basis |
| 2. Demands objectivity | 6. Uses only monetary measures for reports |
| 3. Relies on the criterion of usefulness rather than formal guidelines in reporting information | 7. Adheres to generally accepted accounting principles |
| 4. Measures units in historical dollars | 8. Prepares reports whenever needed |

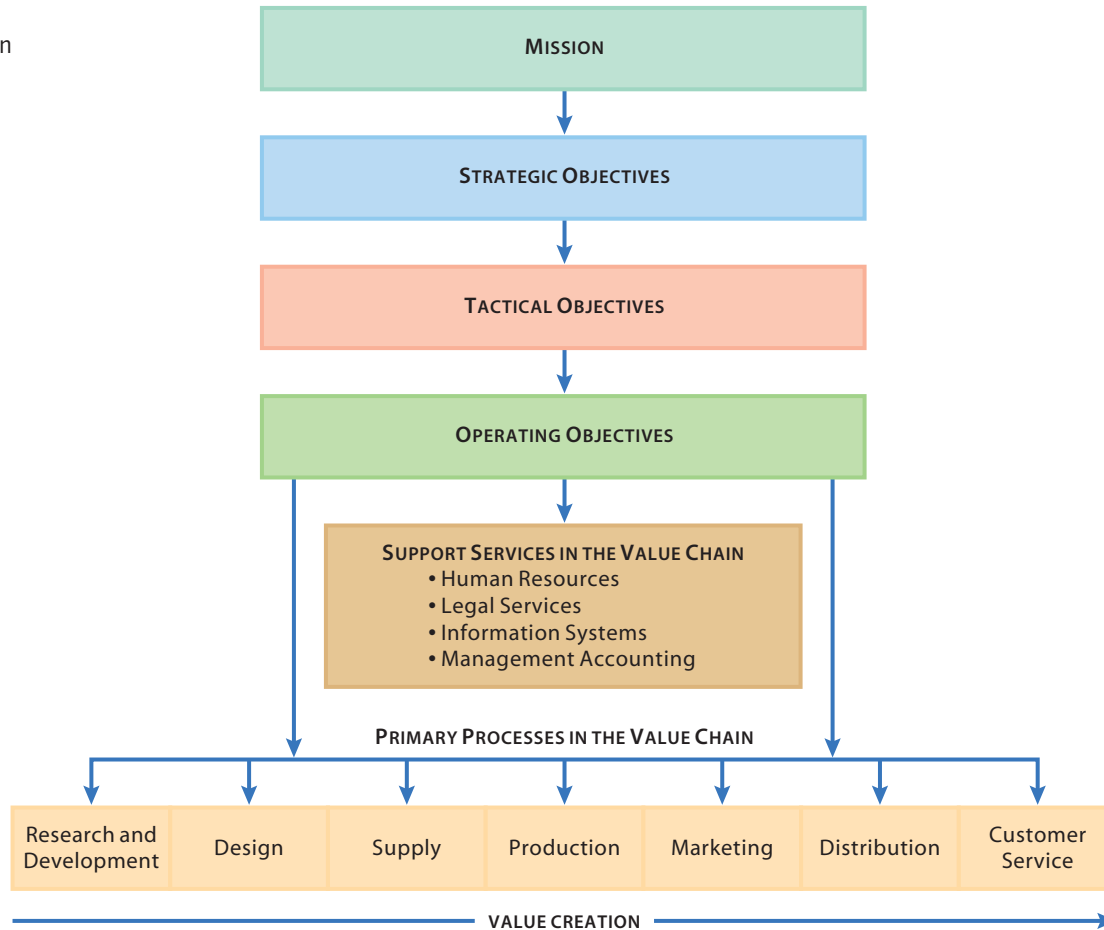
SOLUTION

1. MA; 2. FA; 3. MA; 4. FA; 5. FA; 6. FA; 7. FA; 8. MA

Value Chain Analysis

LO2 Describe the value chain and its usefulness in analyzing a business.

Each step in the making of a product or the delivery of a service can be thought of as a link in a chain that adds value to the product or service. This concept of how a business fulfills its mission and objectives is known as the **value chain**. As shown in Figure 1-3, the steps that add value to a product or service—which range from research and development to customer service—are known as **primary processes**. The value chain also includes **support services**, such as legal services and management accounting. These services facilitate the primary processes but do not add value to the final product or service. Their roles are critical, however, to making the primary processes as efficient and effective as possible.

FIGURE 1-3
The Value Chain

Primary Processes and Support Services

EXAMPLE. Let's assume that Good Foods Store has had some success, and Vanna Lang now wants to determine the feasibility of making and selling her own brand of candy. The primary processes that will add value to the new candy are as follows:

- ▶ **Research and development:** developing new and better products or services. Lang plans to add value by developing a candy that has less sugar content than similar confections.
- ▶ **Design:** creating improved and distinctive shapes, labels, or packages for products. For example, a package that is attractive and that describes the desirable features of Lang's new candy will add value to the product.
- ▶ **Supply:** purchasing materials for products or services. Lang will want to purchase high-quality sugar, chocolate, and other ingredients for the candy, as well as high-quality packaging.
- ▶ **Production:** manufacturing the product or service. To add value to the new candy, Lang will want to implement efficient manufacturing and packaging processes.
- ▶ **Marketing:** communicating information about the products or services and selling them. Attractive advertisements will facilitate sale of the new candy to customers.

- ▶ **Distribution:** delivering the product or service to the customer. Courteous and efficient service for in-store customers will add value to the product. Lang may also want to accommodate Internet customers by providing shipping.
- ▶ **Customer service:** following up with service after sales or providing warranty service. For example, Lang may offer free replacement of any candy that does not satisfy the customer. She could also use questionnaires to measure customer satisfaction.

The support services that provide the infrastructure for the primary processes are as follows:

- ▶ **Human resources:** hiring and training employees to carry out all the functions of the business. Lang will need to hire and train personnel to make the new candy.
- ▶ **Legal services:** maintaining and monitoring all contracts, agreements, obligations, and other relationships with outside parties. For example, Lang will want legal advice when applying for a trademark for the new candy's name and when signing contracts with suppliers.
- ▶ **Information systems:** establishing and maintaining technological means of controlling and communicating within the organization. Lang will want a computerized accounting system that keeps not only financial records but customer information as well.
- ▶ **Management accounting:** provides essential information in any business.

Advantages of Value Chain Analysis

An advantage of value chain analysis is that it allows a company to focus on its core competencies. A **core competency** is the thing that a company does best. It is what gives a company an advantage over its competitors. For example, **Wal-Mart** is known for having the lowest prices; that is its core competency.

A common result of value chain analysis is outsourcing, which can also be of benefit to a business. **Outsourcing** is the engagement of other companies to perform a process or service in the value chain that is not among an organization's core competencies. For instance, Wal-Mart outsources its inventory management to its vendors, who monitor and stock Wal-Mart's stores and warehouses.

Managers and Value Chain Analysis

In today's competitive global business environment, analysis of the value chain is critical to most companies' survival. Managers at Wal-Mart and other organizations must provide the highest value to customers at the lowest cost, and low cost often equates with the speed at which the primary processes of the value chain are executed. Time to market is very important.

Managers must also make the services that support the primary processes as efficient as possible. These services are essential and cannot be eliminated, but because they do not add value to the final product, they must be implemented as economically as possible. Businesses have been making progress in this area. For example, over the past ten years, the cost of the accounting function in many companies as a percentage of total revenue has declined from 6 percent to 2 percent. Technology has played a big role in making this economy possible.

EXAMPLE. To determine whether manufacturing and selling her own brand of candy will be profitable, Vanna Lang will need accurate information about the cost of the candy. She knows that if her candy is to be competitive, she cannot sell it for more than \$10 per pound. Further, she has an idea of how much

Study Note

A company cannot succeed by trying to do everything at the highest level. It has to focus on its core competencies to give customers the best value.

EXHIBIT 15-2

Value Chain Analysis

Good Foods Store		
Projected Costs of New Candy		
June		
Primary Process	Initial Costs per Pound	Revised Costs per Pound
Research and development	\$0.25	\$0.25
Design	0.10	0.10
Supply	1.10	0.60
Production	4.50	3.50
Marketing	0.50	0.50
Distribution	0.90	0.90
Customer service	0.65	0.65
Total cost	<u>\$8.00</u>	<u>\$6.50</u>

candy she can sell in the first year. Based on this information, her accountant, Sal Chavez, analyzes the value chain and projects the initial costs per pound shown in Exhibit 1-2. The total cost of \$8 per pound worries Lang because with a selling price of \$10, it leaves only \$2, or 20 percent of revenue, to cover all the support services and provide a profit. Lang believes that if the enterprise is to be successful, this percentage, called the *margin*, must be at least 35 percent. Since the selling price is constrained by the competition, she must find a way to reduce costs.

- ▶ Option 1: Chavez tells her that the company could achieve a lower total cost per pound by selling a higher volume of candy, but that is not realistic for the new product. He also points out that the largest projected costs in the store's value chain are for supply and production. Because Lang plans to order ingredients from a number of suppliers, her orders would not be large enough to qualify for quantity discounts and savings on shipping. Using a single supplier could reduce the supply cost by \$0.50 per unit.
- ▶ Option 2: Another way of reducing the cost of production would be to outsource this process to a candy manufacturer, whose high volume of products would allow it to produce the candy at a much lower cost than could be done at Good Foods Store. Outsourcing would reduce the production cost to \$3.50 per unit. Thus, the total unit cost would be reduced to \$6.50, as shown in Exhibit 1-2. This per unit cost would enable the company to sell the candy at a competitive \$10 per pound and make the targeted margin of 35 percent ($\$3.50 \div \10.00).

This value chain analysis illustrates two important points. First, Good Food Store's mission is as a retailer. The company has no experience in making candy. Manufacturing candy would require a change in the company's mission and major changes in the way it does business.

Second, outsourcing portions of the value chain that are not part of a business's core competency is often the best business policy. Since Good Foods Store does not have a core competency in manufacturing candy, it would not be competitive in this field. Vanna Lang would be better off having an experienced candy manufacturer produce the candy according to her specifications and then selling the candy under her store's label. As Lang's business grows, increased volume may allow her to reconsider undertaking the manufacture of candy.

STOP & APPLY >

The following unit costs were determined by dividing the total costs of each component by the number of products produced. From these unit costs, determine the total cost per unit of primary processes and the total cost per unit of support services.

Research and development	\$ 1.25
Human resources	1.35
Design	0.15
Supply	1.10
Legal services	0.40
Production	4.00
Marketing	0.80
Distribution	0.90
Customer service	0.65
Information systems	0.75
Management accounting	0.10
Total cost per unit	<u>\$11.45</u>

SOLUTION

Primary Processes:

Research and development	\$1.25
Design	0.15
Supply	1.10
Production	4.00
Marketing	0.80
Distribution	0.90
Customer service	0.65
Total cost per unit	<u>\$8.85</u>

Support Services:

Human resources	\$1.35
Legal services	0.40
Information systems	0.75
Management accounting	0.10
Total cost per unit	<u>\$2.60</u>

Continuous Improvement

LO3 Identify the management tools used for continuous improvement.

Today, managers in all parts of the world have ready access to international markets and to current information for informed decision making. As a result, global competition has increased significantly. One of the most valuable lessons gained from this increase in competition is that management cannot afford to become complacent. The concept of **continuous improvement** evolved to avoid such complacency. Organizations that adhere to continuous improvement are never satisfied with what is; they constantly seek improved quality and lower cost through better methods, products, services, processes, or resources. In response to this concept, several important management tools have emerged. These tools help companies remain competitive by focusing on continuous improvement of business methods.

Management Tools for Continuous Improvement

Among the management tools that companies use are the just-in-time operating philosophy, total quality management, activity-based management, and the theory of constraints.

Just-in-Time Operating Philosophy The **just-in-time (JIT) operating philosophy** requires that all resources—materials, personnel, and facilities—be acquired and used only when they are needed. Its objectives are to improve productivity and eliminate waste.

In a JIT environment, production processes are consolidated and workers are trained to be multiskilled so that they can operate several different machines. Materials and supplies are delivered just at the time they are needed in the production process, which significantly reduces inventories of materials. Production is usually started only when an order is received, and the ordered goods are shipped when completed, which reduces the inventories of finished goods.

When manufacturing companies adopt the JIT operating philosophy, the management system is called **lean production** since it reduces production time and costs, investment in materials inventory, and materials waste, and it results in higher-quality goods. Funds that are no longer invested in inventory can be redirected according to the goals of the company's business plan. JIT methods help retailers like **Wal-Mart** and manufacturers like **Harley-Davidson** assign more accurate costs to their products and identify the costs of waste and inefficient operation. Wal-Mart for example, requires vendors to restock inventory often and pays them only when the goods sell. This minimizes the funds invested in inventory and allows the retailer to focus on offering high-demand merchandise at attractive prices.

Total Quality Management **Total quality management (TQM)** requires that all parts of a business focus on quality. TQM's goal is the improved quality of products or services and the work environment. Workers are empowered to make operating decisions that improve quality in both areas. All employees are tasked to spot possible causes of poor quality, use resources efficiently and effectively to improve quality, and reduce the time needed to complete a task or provide a service.

TQM, like the JIT operating philosophy, focuses on improving product or service quality by identifying and reducing or eliminating the causes of waste. Like JIT, TQM results in reduced waste of materials, higher-quality goods, and lower production costs in manufacturing environments.

To determine the impact of poor quality on profits, TQM managers use accounting information about the **costs of quality**. The costs of quality include both the costs of achieving quality (such as training costs and inspection costs) and the costs of poor quality (such as the costs of rework and of handling customer complaints). Managers use information about the costs of quality:

- ▶ to relate their organization's business plan to its daily operating activities,
- ▶ to stimulate improvement by sharing this information with all employees,
- ▶ to identify opportunities for reducing costs and customer dissatisfaction, and
- ▶ to determine the costs of quality relative to net income.

For retailers like Wal-Mart and Good Foods Store, TQM results in a quality customer experience before, during, and after the sale.

Activity-Based Management **Activity-based management (ABM)** is an approach to managing an organization that identifies all major activities or tasks involved in making a product or service, determines the resources consumed by each of those activities and why the resources are used, and categorizes the activities as either adding value to a product or service or not adding value.

Activities that add value to a product or service, as perceived by the customer, are known as **value-adding activities**. All other activities are called **nonvalue-adding activities**; they add cost to a product or service but do not increase its market value. ABM eliminates nonvalue-adding activities that do not support the organization; those that do support the organization are focal points for cost reduction. ABM results in reduced costs, reduced waste of resources, increased efficiency, and increased customer satisfaction.

ABM includes a management accounting practice called activity-based costing. **Activity-based costing (ABC)**:

- ▶ identifies all of an organization's major operating activities (both production and nonproduction),
- ▶ traces costs to those activities or cost pools, and
- ▶ assigns costs to the products or services that use the resources supplied by those activities.

The advantage to using ABC is that ABC produces more accurate costs than traditional cost allocation methods, which leads to improved decision making.

Theory of Constraints According to the **theory of constraints (TOC)**, limiting factors, or bottlenecks, occur during the production of any product or service, but once managers identify such a constraint, they can focus their attention and resources on it and achieve significant improvements. TOC thus helps managers set priorities for how they spend their time and resources. In identifying constraints, managers rely on the information that management accounting provides.

EXAMPLE. Suppose Vanna Lang wants to increase sales of store-roasted coffees. After reviewing management accounting reports, she concludes that the limited production capacity of her equipment—a roaster that can roast only 100 pounds of coffee beans per hour—limits the sales of the store's coffee. To overcome this constraint, she can rent or purchase a second roaster. The increase in production will enable her to increase coffee sales.

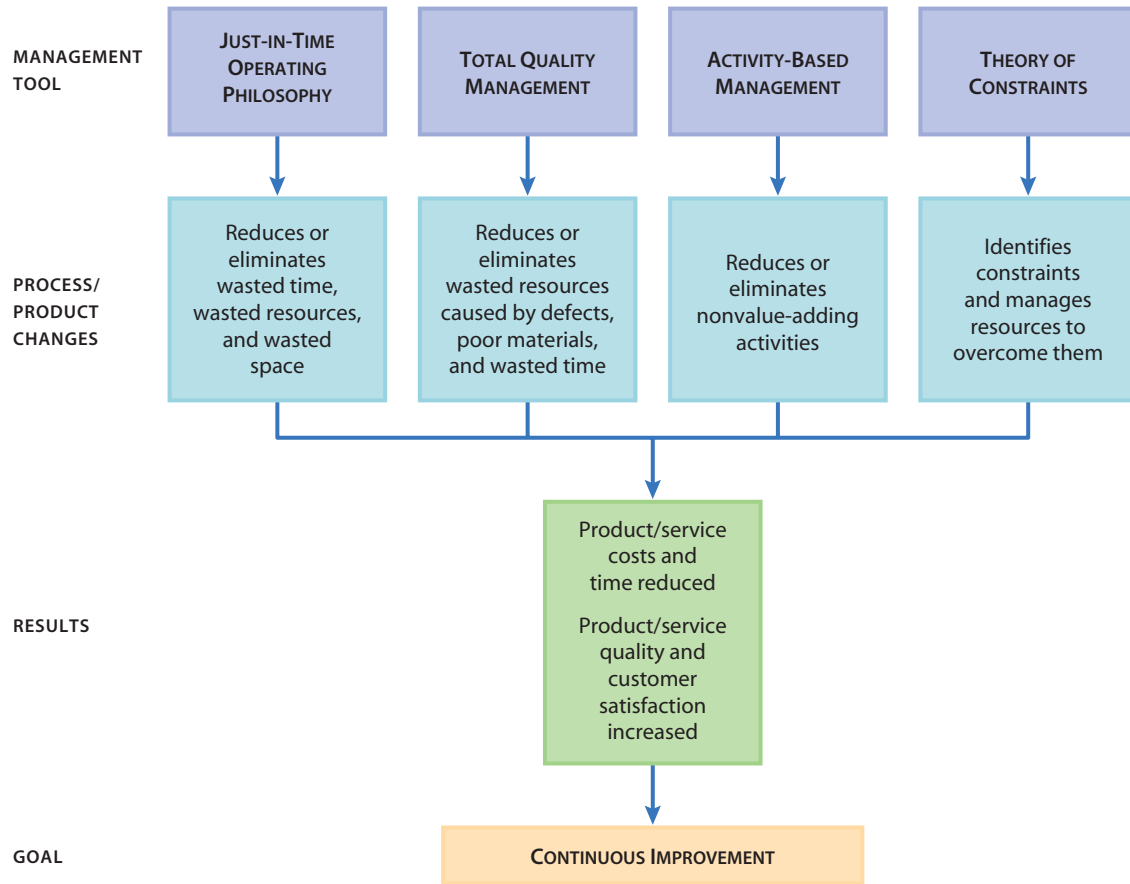
Achieving Continuous Improvement

JIT, TQM, ABM, and TOC all make a contribution to continuous improvement, as shown in Figure I-4. In the just-in-time operating environment, management wages war on wasted time, wasted resources, and wasted space. All employees are encouraged to look for ways of improving processes and saving time. Total quality management focuses on improving the quality of the product or service and the work environment. It pursues continuous improvement by reducing the number of defective products and the time needed to complete a task or provide a service. Activity-based management seeks continuous improvement by emphasizing the ongoing reduction or elimination of nonvalue-adding activities. The theory of constraints helps managers focus resources on efforts that will produce the most effective improvements.

Each of these management tools can be used individually, or parts of them can be combined to create a new operating environment. They are applicable in service businesses, such as banking, as well as in manufacturing and retail businesses. By focusing attention on continuous improvement and fine-tuning of operations, they contribute to the same results in any organization:

- ▶ a reduction in product or service costs and delivery time,
- ▶ an improvement in the quality of the product or service, and
- ▶ an increase in customer satisfaction.

FIGURE 1-4 The Continuous Improvement Environment



STOP

& APPLY >

Recently, you dined with four chief financial officers (CFOs) who were attending a seminar on management tools and approaches to improving operations. During dinner, the CFOs shared information about their organizations' current operating environments. Excerpts from the dinner conversation appear below. Indicate whether each excerpt describes activity-based management (ABM), the just-in-time (JIT) operating philosophy, total quality management (TQM), or the theory of constraints (TOC).

CFO 1: We think quality can be achieved through carefully designed production processes. We focus on minimizing the time needed to move, store, queue, and inspect our materials and products. We've reduced inventories by purchasing and using materials only when they're needed.

CFO 2: Your approach is good. But we're more concerned with our total operating environment, so we have a strategy that asks all employees to contribute to the quality of both our products and our work environment. We focus on eliminating poor product quality by reducing waste and inefficiencies in our current operating methods.

(continued)

CFO 3: Our organization has adopted a strategy for producing high-quality products that incorporates many of your approaches. We also want to manage our resources effectively, and we do it by monitoring operating activities. We analyze all activities to eliminate or reduce the ones that don't add value to products.

CFO 4: All of your approaches are good, but how do you set priorities for your management efforts? We find that we achieve the greatest improvements by focusing our time and resources on the bottlenecks in our production processes.

SOLUTION

CFO 1: JIT; CFO 2: TQM; CFO 3: ABM; CFO 4: TOC

Performance Measures: A Key to Achieving Organizational Objectives

LO4 Explain the balanced scorecard and its relationship to performance measures.

Performance measures are quantitative tools that gauge an organization's performance in relation to a specific goal or an expected outcome. Performance measures may be financial or nonfinancial.

- ▶ Financial performance measures include return on investment, net income as a percentage of sales, and the costs of poor quality as a percentage of sales. Such measures use monetary information to gauge the performance of a profit-generating organization or its segments—its divisions, departments, product lines, sales territories, or operating activities.
- ▶ Nonfinancial performance measures include the number of times an activity occurs or the time taken to perform a task. Examples are number of customer complaints, number of orders shipped the same day, and the time taken to fill an order. Such performance measures are useful in reducing or eliminating waste and inefficiencies in operating activities.

Using Performance Measures in the Management Process

Managers use performance measures in all stages of the management process.

- ▶ In the planning stage, they establish performance measures that will support the organization's mission and the objectives of its business plan, such as reducing costs and increasing quality, efficiency, timeliness, and customer satisfaction. As you will recall from earlier in the chapter, Vanna Lang selected the number of customer complaints as a performance measure to monitor the quality of service at Good Foods Store.
- ▶ As managers perform their duties, they use the performance measures they established in the planning stage to guide and motivate employees and to assign costs to products, departments, and operating activities. Vanna Lang will record the number of customer complaints during the year. She can group the information by type of complaint or by the employee involved in the service.
- ▶ When evaluating performance, managers use the information that performance measures have provided to analyze significant differences between actual and planned performance and to identify ways of improving performance. By comparing the actual and planned number of customer complaints, Lang can identify problem areas and develop solutions.

- ▶ When communicating with stakeholders, managers use information derived from performance measurement to report results and develop new budgets. If Lang needed formal reports, she could prepare performance evaluations based on this information.

Study Note

The balanced scorecard focuses all perspectives of a business on accomplishing the business's mission.

Study Note

The balanced scorecard provides a way of linking the lead performance indicators of employees, internal business processes, and customer needs to the lag performance indicator of external financial results. In other words, if managers can foster excellent performance for three of the stakeholder groups, good financial results will occur for the investor stakeholder group.

The Balanced Scorecard

If an organization is to achieve its mission and objectives, it must identify the areas in which it needs to excel and establish measures of performance in these critical areas. As we have indicated, effective performance measurement requires an approach that uses both financial and nonfinancial measures that are tied to a company's mission and objectives. One such approach that has gained wide acceptance is the balanced scorecard.

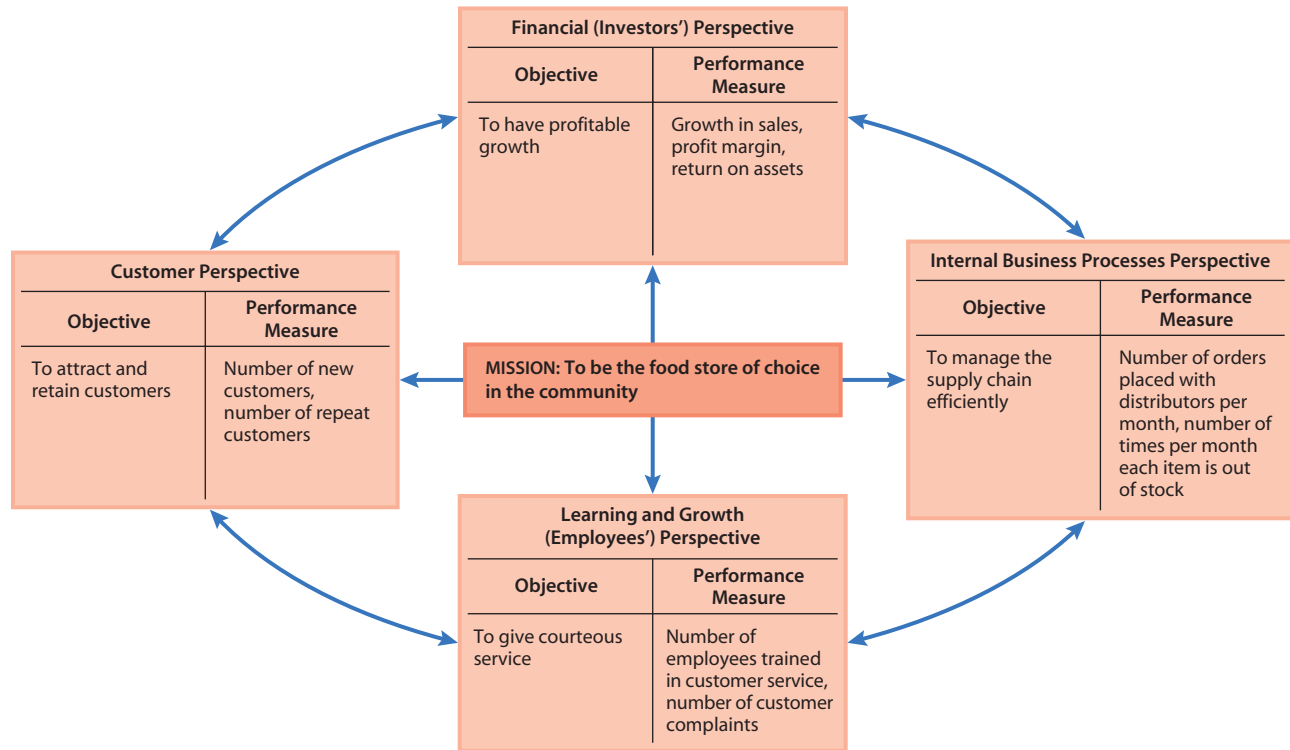
The **balanced scorecard** is a framework that links the perspectives of an organization's four stakeholder groups to the organization's mission, objectives, resources, and performance measures. The four stakeholder groups are as follows:

- ▶ Stakeholders with a financial perspective (owners, investors, and creditors) value improvements in financial measures, such as net income and return on investment.
- ▶ Stakeholders with a learning and growth perspective (employees) value high wages, job satisfaction, and opportunities to fulfill their potential.
- ▶ Stakeholders who focus on the business's internal processes value the safe and cost-effective production of high-quality products.
- ▶ Stakeholders with a customer perspective value high-quality products that are low in cost.

Although their perspectives differ, these stakeholder groups may be interested in the same measurable performance goals. For example, holders of both the customer and internal business processes perspectives are interested in performance that results in high-quality products.

EXAMPLE. Figure 1-5 applies the balanced scorecard to Good Foods Store. The company's mission is to be the food store of choice in the community. This mission is at the center of the company's balanced scorecard. Surrounding it are the four interrelated perspectives.

- ▶ **Learning and Growth:** At the base of the scorecard is the learning and growth perspective. Here, part of the objective, or performance goal, is to provide courteous service. Because training employees in customer service should result in courteous service, performance related to this objective can be measured in terms of how many employees have received training. The number of customer complaints is another measure of courteous service.
- ▶ **Internal Business Processes:** From the perspective of internal business processes, the objective is to help achieve the company's mission by managing the supply chain efficiently, which should contribute to customer satisfaction. Efficiency in the ordering process can be measured by recording the number of orders placed with distributors each month and the number of times per month that customers ask for items that are not in stock.
- ▶ **Customer:** If the objectives of the learning and growth and internal business processes perspectives are met, this should result in attracting customers and

FIGURE 1-5 The Balanced Scorecard for Good Foods Store

Source: Adapted from Robert S. Kaplan and David P. Norton, "The Balanced Scorecard: Measures That Drive Performance," *Harvard Business Review*, July–August 2005.

retaining them, which is the objective of the customer perspective. Performance related to this objective is measured by tracking the number of new customers and the number of repeat customers.

- ▶ **Financial:** Satisfied customers should help achieve the objective of the financial perspective, which is profitable growth. Profitable growth is measured by growth in sales, profit margin, and return on assets.



FOCUS ON BUSINESS PRACTICE

How Does the Balanced Scorecard Measure Success at Futura Industries?

Futura Industries is not a famous company, but it is one of the best. Based in Utah, it is rated as that state's top privately owned employer and serves a high-end niche in such diverse markets as floor coverings, electronics, transportation, and shower doors. In achieving its success, Futura uses the balanced scorecard. Futura has developed the following performance measures:

- ▶ Employee turnover is a measure of learning and growth.
- ▶ Percentage of sales from new products and total production cost per standard hour are measures of the company's internal processes.
- ▶ The number of customers' complaints and percentage of materials returned are the measures of customer satisfaction.
- ▶ Income and gross margin are among the measures of financial performance.⁶

Benchmarking

The balanced scorecard enables a company to determine whether it is making continuous improvement in its operations. But to ensure its success, a company must also compare its performance with that of similar companies in the same industry. **Benchmarking** is a technique for determining a company's competitive advantage by comparing its performance with that of its closest competitors. **Benchmarks** are measures of the best practices in an industry.

EXAMPLE. To obtain information about benchmarks in the retail grocery industry, Vanna Lang might join a trade association for small retail shops or food stores. Information about these benchmarks would be useful to her in setting targets for the performance measures in Good Foods Store's balanced scorecard.

STOP & APPLY >

Connie's Takeout caters to young professionals who want a good meal at home but do not have time to prepare it. Connie's has developed the following business objectives:

- | | |
|----------------------------------------------|------------------------------|
| 1. To provide fast, courteous service | 3. To have repeat customers |
| 2. To manage the inventory of food carefully | 4. To be profitable and grow |

Connie's has also developed the following performance measures:

- | | |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 5. Growth in revenues per quarter and net income | 7. Average customer time at the counter before being waited on |
| 6. Average unsold food at the end of the business day as a percentage of the total food purchased that day | 8. Percentage of customers who have shopped in the store before |

Match each of these objectives and performance measures with the four perspectives of the balanced scorecard: financial perspective, learning and growth perspective, internal business processes perspective, and customer perspective.

SOLUTION

Financial perspective: 4, 5; learning and growth perspective: 1, 7; internal business processes perspective: 2, 6; customer perspective: 3, 8

Standards of Ethical Conduct

LO5 Identify the standards of ethical conduct for management accountants.

Managers balance the interests of external parties (e.g., customers, owners, suppliers, governmental agencies, and the local community) when they make decisions about the proper use of organizational resources and the financial reporting of their actions. When ethical conflicts arise, management accountants have a responsibility to help managers balance those interests. For example, **Wal-Mart's** goal is to provide customers with low-cost, durable, and safe products. It also seeks ethical and environmentally responsible global sourcing with its suppliers. But its suppliers may differ with Wal-Mart's management on these goals as they pursue maximum profits in countries where social and environmental standards are lax or nonexistent. These conflicting supplier/purchaser interests have prompted Wal-Mart to:

- ▶ Announce that it will only work with suppliers who maintain Wal-Mart standards throughout their relationship.



FOCUS ON BUSINESS PRACTICE

How to Blow the Whistle on Fraud

According to PricewaterhouseCoopers's fourth biennial survey of more than 5,400 companies in 40 countries, eradicating fraud is extremely difficult. Despite increased attention to fraud detection systems and stronger internal controls, half of the companies interviewed had fallen victim to some type of fraud in the previous two years. The average cost of the fraud was about \$3.2 million per company. Fraud appeared most likely to happen in Africa, North America, and Central-Eastern Europe.

The Sarbanes-Oxley Act of 2002 requires that all publicly traded companies have an anonymous incident

reporting system. Such a system can help prevent fraud, as can hotlines that provide guidance on ethical dilemmas involved in reporting fraud. An example of such an ethics hotline is the one that the Institute of Management Accountants instituted in 2002. However, PricewaterhouseCoopers's study found that the best fraud deterrents were a company-wide risk management system with a continuous proactive fraud-monitoring component and a strong ethical culture to which all employees subscribe.⁸

- ▶ Start building a framework of social and environmental standards for all global retailers.
- ▶ Call for a single third party auditing system for everyone to assure compliance with these new standards.⁷

To be viewed credibly by the various parties who rely on the information they provide, management accountants must adhere to the highest standards of performance. To provide guidance, the Institute of Management Accountants has issued standards of ethical conduct for practitioners of management accounting and financial management. Those standards, presented in Exhibit 1-3, emphasize that management accountants have responsibilities in the areas of competence, confidentiality, integrity, and credibility.

EXHIBIT 1-3 Statement of Ethical Professional Practice

Members of IMA shall behave ethically. A commitment to ethical professional practice includes: overarching principles that express our values, and standards that guide our conduct.

PRINCIPLES

IMA's overarching ethical principles include: Honesty, Fairness, Objectivity, and Responsibility. Members shall act in accordance with these principles and shall encourage others within their organizations to adhere to them.

STANDARDS

A member's failure to comply with the following standards may result in disciplinary action.

I. COMPETENCE

Each member has a responsibility to:

1. Maintain an appropriate level of professional expertise by continually developing knowledge and skills.
2. Perform professional duties in accordance with relevant laws, regulations, and technical standards.
3. Provide decision support information and recommendations that are accurate, clear, concise, and timely.
4. Recognize and communicate professional limitations or other constraints that would preclude responsible judgment or successful performance of an activity.

(continued)

EXHIBIT 1-3 (Continued)**II. CONFIDENTIALITY**

Each member has a responsibility to:

1. Keep information confidential except when disclosure is authorized or legally required.
2. Inform all relevant parties regarding appropriate use of confidential information. Monitor subordinates' activities to ensure compliance.
3. Refrain from using confidential information for unethical or illegal advantage.

III. INTEGRITY

Each member has a responsibility to:

1. Mitigate actual conflicts of interest. Regularly communicate with business associates to avoid apparent conflicts of interest. Advise all parties of any potential conflicts.
2. Refrain from engaging in any conduct that would prejudice carrying out duties ethically.
3. Abstain from engaging in or supporting any activity that might discredit the profession.

IV. CREDIBILITY

Each member has a responsibility to:

1. Communicate information fairly and objectively.
2. Disclose all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, analyses, or recommendations.
3. Disclose delays or deficiencies in information, timeliness, processing, or internal controls in conformance with organization policy and/or applicable law.

RESOLUTION OF ETHICAL CONFLICT

In applying the Standards of Ethical Professional Practice, you may encounter problems identifying unethical behavior or resolving an ethical conflict. When faced with ethical issues, you should follow your organization's established policies on the resolution of such conflict. If these policies do not resolve the ethical conflict, you should consider the following courses of action:

Discuss the issue with your immediate supervisor except when it appears that the supervisor is involved. In that case, present the issue to the next level. If you cannot achieve a satisfactory resolution, submit the issue to the next management level. If your immediate superior is the chief executive officer or equivalent, the acceptable reviewing authority may be a group such as the audit committee, executive committee, board of directors, board of trustees, or owners. Contact with levels above the immediate superior should be initiated only with your superior's knowledge, assuming he or she is not involved. Communication of such problems to authorities or individuals not employed or engaged by the organization is not considered appropriate, unless you believe there is a clear violation of the law.

Clarify relevant ethical issues by initiating a confidential discussion with an IMA Ethics Counselor or other impartial advisor to obtain a better understanding of possible courses of action.

Consult your own attorney as to legal obligations and rights concerning the ethical conflict.

Source: *IMA Statement of Ethical Professional Practice*, Institute of Management Accountants, www.imanet.org. Reprinted by permission.

STOP**& APPLY >**

Rank in order of importance the management accountant's four areas of responsibility: competence, confidentiality, integrity, and credibility. Explain the reasons for your ranking.

SOLUTION

Rankings will vary depending on the reasoning used concerning the four areas of responsibility. Ranking differences between individuals also reinforces the fact that we approach ethical behavior in a variety of ways and why a code of ethics is necessary.

A LOOK BACK AT ► WAL-MART STORES, INC.



The Decision Point at the beginning of this chapter focused on **Wal-Mart**, a company whose mission is to give ordinary folk the chance to buy the same things as rich people around the world. It posed these questions:

- What is Wal-Mart's strategic plan?
- What management accounting tools does Wal-Mart use to stay ahead of its competitors?
- What role does management accounting play in Wal-Mart's endeavors?

Wal-Mart's strategic plan focuses on achieving the company's objective of being the low-cost leader in the markets that it enters. This strategy drives the way Wal-Mart's managers address stakeholder perspectives, as well as how they formulate tactical and operating plans. To stay agile, flexible, and ahead of its competitors, Wal-Mart uses management tools like supply and value chains to standardize requirements and procedures and keep the costs of doing business low. These cost containment measures demonstrate Wal-Mart's resolve to remain an industry leader. But what role does management accounting play in this endeavor?

Management accounting provides the information necessary for effective decision making. Wal-Mart's managers use management accounting information in making decisions about everything from entering new markets like health care, to selecting vendors and products, to developing and implementing new supply-chain processes, to pricing and marketing its goods.

Management accounting also provides Wal-Mart's managers with objective data that they can use to measure the company's performance in terms of its key success factor—cost. Among the management accounting tools used are budgets, which set daily operating goals and provide targets for evaluating a store's performance. As Wal-Mart strives to improve its sales, earnings per share, and profitability by maintaining its record of successes, it will continue to rely on the information that management accounting provides.

Review Problem

Supply Chain and Value Chain Analysis **LO2**

Wal-mart sells hundreds of prescription drugs for \$4.00 for a 30-day supply. Suppose Medicine for All manufactures generic prescription drugs and currently sells them for \$3.00 for a 30-day supply. Wal-Mart will buy these drugs if Medicine for All lowers its price to \$2.00. However, if Medicine for All lowers its price with the current cost structure, it will lose money. Medicine for All's management applies value chain analysis to the company's operations in an effort to reduce costs and attract Wal-Mart's business. A study by the company's management accountant has determined the following per unit costs for primary processes:

Primary Process	Cost per Unit
Research and development	\$0.50
Design	0.25
Supply	0.35
Production	0.50
Advertising and marketing	0.55
Distribution	0.20
Customer service	0.05
Total cost	<u>\$2.40</u>

To generate a gross margin large enough for the company to cover its operating costs and earn a profit, Medicine for All must lower its total cost per 30-day supply for primary processes to less than \$1.60. After analyzing operations, management believes the following cost reduction proposals for primary processes are possible:

- Research and development and design are critical functions because the market and competition require constant development of new, safe packaging features and higher quality at lower cost. Nevertheless, management feels that the cost of these processes must be reduced by 20 percent.
- Five different suppliers currently provide the components for the generic medicines. Ordering these components from just two suppliers and negotiating lower prices could result in a savings of 30 percent.
- The generic drugs are currently manufactured in Mexico. By shifting production to China, the unit cost of production can be lowered by 40 percent.
- Management believes that by working with Wal-Mart they can cut their advertising and marketing budgets by 70 percent.
- Distribution costs are already very low, but management will set a target of reducing the cost by 10 percent.
- Customer support and service has been a weakness of the company and has resulted in lost sales. Management therefore proposes increasing the cost per unit of customer support to Wal-Mart by 50 percent.

Required

1. Prepare a table showing Medicine for All's current cost of primary processes and the projected cost per 30-day supply based on management's proposals for cost reduction.
2. Will management's proposals for cost reduction achieve the targeted total cost of less than \$1.60 per 30-day supply?
3. Manager insight: What are the company's support services? What role should these services play in the value chain analysis?

Answers to Review Problem

1.

	Current Cost per 30-Day Supply	Percentage (Decrease) Increase	Projected Cost per 30-Day Supply*
Research and development	\$0.50	(20%)	\$0.400
Design	0.25	(20%)	0.200
Supply	0.35	(30%)	0.245
Production	0.50	(40%)	0.300
Advertising and marketing	0.55	(70%)	0.165
Distribution	0.20	(10%)	0.180
Customer service	0.05	50%	0.075
Total	<u><u>\$2.40</u></u>		<u><u>\$1.565</u></u>

*Computations: $\$0.50 \times (100\% - 20\%) = \0.40 ; $\$0.25 \times (100\% - 20\%) = \0.20 ; $\$0.35 \times (100\% - 30\%) = \0.245 ; $\$0.50 \times (100\% - 40\%) = \0.30 ; $\$0.55 \times (100\% - 70\%) = \0.165 ; $\$0.20 \times (100\% - 10\%) = \0.18 ; and $\$0.05 \times (100\% + 50\%) = \0.075 .

2. Yes, \$1.565 is lower than \$1.60. Accept Wal-Mart's offer.
3. The support services are human resources, legal services, information systems, and management accounting. The analysis has not mentioned these services, which are necessary but do not provide direct value to the final product. Management should analyze these functions carefully to see if they can be reduced.


STOP & REVIEW >
LO1 Distinguish management accounting from financial accounting and explain how management accounting supports the management process.

Management accounting involves partnering with management in decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy.

Management accounting reports provide information for planning, control, performance measurement, and decision making to managers and employees when they need such information. These reports have a flexible format; they can present either historical or future-oriented information expressed in dollar amounts or physical measures. In contrast, financial accounting reports provide information about an organization's past performance to owners, lenders, customers, and governmental agencies on a periodic basis. Financial accounting reports follow strict guidelines defined by generally accepted accounting principles.

Management accounting supports each stage of the management process. When managers plan, they work with management accounting to establish strategic, tactical, and operating objectives that reflect their company's mission and to formulate a comprehensive business plan for achieving those objectives. The plan is usually expressed in financial terms in the form of budgets. When managers implement the plan, they use the information provided in the budgets to manage the business in the context of its supply chain. In evaluating performance, managers compare actual performance with planned performance and take steps to correct any problems. Reports reflect the results of planning, executing, and evaluating operations and may be prepared for external or internal use.

LO2 Describe the value chain and its usefulness in analyzing a business.

The value chain conceives of each step in the production of a product or the delivery of a service as a link in a chain that adds value to the product or service. These value-adding steps—research and development, design, supply, production, marketing, distribution, and customer service—are known as primary processes. The value chain also includes support services—human resources, legal services, information services, and management accounting. Support services facilitate the primary processes but do not add value to the final product. Value chain analysis enables a company to focus on its core competencies. Parts of the value chain that are not core competencies are frequently outsourced.

LO3 Identify the management tools used for continuous improvement.

Management tools for continuous improvement include the just-in-time (JIT) operating philosophy, total quality management (TQM), activity-based management (ABM), and the theory of constraints (TOC). These tools are designed to help businesses meet the demands of global competition by reducing resource waste and costs and by improving product or service quality, thereby increasing customer satisfaction.

Management accounting responds to a just-in-time operating environment by providing an information system that is sensitive to changes in production processes. In a total quality management environment, management accounting provides information about the costs of quality. Activity-based management's assignment of overhead costs to products or services relies on the accounting practice known as activity-based costing (ABC). In businesses that use the theory of constraints, management accounting identifies process or product constraints.

LO4 Explain the balanced scorecard and its relationship to performance measures.

The balanced scorecard links the perspectives of an organization's stakeholder groups—financial (investors and owners), learning and growth (employees), internal business processes, and customers—to the organization's mission, objectives, resources, and performance measures. Performance measures are used to assess whether the objectives of each of the four perspectives are being met. Benchmarking is a technique for determining a company's competitive advantage by comparing its performance with that of its industry peers.

LO5 Identify the standards of ethical conduct for management accountants.

The Statement of Ethical Professional Practice emphasizes the Institute of Management Accounting members' responsibilities in the areas of competence, confidentiality, integrity, and credibility. These standards of conduct help management accountants recognize and avoid situations that could compromise their ability to supply management with accurate and relevant information.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Activity-based costing (ABC) 17 (L03)	Costs of quality 16 (L03)	Primary processes 11 (L02)
Activity-based management (ABM) 16 (L03)	Just-in-time (JIT) operating philosophy 16 (L03)	Strategic objectives 6 (L01)
Balanced scorecard 20 (L04)	Lean production 16 (L03)	Supply chain 8 (L01)
Benchmarking 22 (L04)	Management accounting 4 (L01)	Support services 11 (L02)
Benchmarks 22 (L04)	Mission statement 5 (L01)	Tactical objectives 6 (L01)
Business plan 7 (L01)	Nonvalue-adding activities 17 (L03)	Theory of constraints (TOC) 17 (L03)
Continuous improvement 15 (L03)	Operating objectives 6 (L01)	Total quality management (TQM) 16 (L03)
Core competency 13 (L02)	Outsourcing 13 (L02)	Value-adding activities 17 (L03)
	Performance measures 19 (L04)	Value chain 11 (L02)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

LO1 Management Accounting Versus Financial Accounting

SE 1. Management accounting differs from financial accounting in a number of ways. Indicate whether each of the following characteristics relates to management accounting (MA) or financial accounting (FA):

1. Publically reported
2. Forward looking
3. Usually confidential
4. Complies with accounting standards
5. Reports past performance
6. Uses physical measures as well as monetary ones for reports
7. Focus on business decision making
8. Driven by user needs

LO1 Strategic Positioning

SE 2. Organizations stake out different strategic positions to add value and achieve success. Some strive to be low-cost leaders like **Wal-Mart**, while others become the high-end quality leaders like **Whole Foods Market**. Identify which of the following organizations are low-cost leaders (C) and which are quality leaders (Q):

- | | |
|-----------------------------|-----------------------------|
| 1. Tiffany & Co. | 6. Rent-a-Wreck |
| 2. Yale University | 7. Hertz Rental Cars |
| 3. Local community college | 8. Pepsi-Cola |
| 4. Lexus | 9. Store-brand soda |
| 5. Kia | |

LO1 The Management Process

SE 3. Indicate whether each of the following management activities in a department store is part of planning (PL), performing (PE), evaluating (E), or communicating (C):

1. Completing a balance sheet and income statement at the end of the year
2. Training a clerk to complete a cash sale
3. Meeting with department managers to develop performance measures for sales personnel
4. Renting a local warehouse to store excess inventory of clothing
5. Evaluating the performance of the shoe department by examining the significant differences between its actual and planned expenses for the month
6. Preparing an annual budget of anticipated sales for each department and the entire store

LO1 Report Preparation

SE 4. Molly Metz, president of Metz Industries, asked controller Rick Caputo to prepare a report on the use of electricity by each of the organization's five divisions. Increases in electricity costs in the divisions ranged from 20 to 35 percent over the past year. What questions should Rick ask before he begins his analysis?

L01 L02 The Supply Chain and the Value Chain

SE 5. Indicate whether each of the following is part of the supply chain (SC), a primary process (PP) in the value chain, or a support service (SS) in the value chain:

1. Human resources
2. Research and development
3. Supplier
4. Management accounting
5. Customer service
6. Retailer

L02 The Value Chain

SE 6. The following unit costs were determined by dividing the total costs of each component by the number of products produced. From these unit costs, determine the total cost per unit of primary processes and the total cost per unit of support services.

Research and development	\$ 1.40
Human resources	1.45
Design	0.15
Supply	1.10
Legal services	0.50
Production	4.00
Marketing	0.80
Distribution	0.90
Customer service	0.65
Information systems	0.85
Management accounting	<u>0.20</u>
Total cost per unit	<u><u>\$12.00</u></u>

L03 JIT and Continuous Improvement

SE 7. The just-in-time operating environment focuses on reducing or eliminating the waste of resources. Resources include physical assets such as machinery and buildings, labor time, and materials and parts used in the production process. Choose one of those resources and describe how it could be wasted. How can an organization prevent the waste of that resource? How can the concept of continuous improvement be implemented to reduce the waste of that resource?

L03 TQM and Value

SE 8. DUDs Dry Cleaners recently adopted total quality management. Dee Mathias, the owner, has hired you as a consultant. Classify each of the following activities as either value-adding (V) or nonvalue-adding (NV):

1. Providing same-day service
2. Closing the store on weekends
3. Providing free delivery service
4. Having a seamstress on site
5. Making customers pay for parking

L04 The Balanced Scorecard: Stakeholder Values

SE 9. In the balanced scorecard approach, stakeholder groups with different perspectives value different performance goals. Sometimes, however, they may be interested in the same goal. Indicate which stakeholder groups—financial (F), learning and growth (L), internal business processes (P), and customers (C)—value the following performance goals:

1. High wages
2. Safe products

3. Low-priced products
4. Improved return on investment
5. Job security
6. Cost-effective production processes

L05 Ethical Conduct

SE 10. Topher Sones, a management accountant for Beauty Cosmetics Company, has lunch every day with his friend Joel Saikle, who is a management accountant for Glowly Cosmetics, Inc., a competitor of Beauty Cosmetics. Last week, Topher couldn't decide how to treat some information in a report he was preparing, so he discussed it with Joel. Is Topher adhering to the ethical standards of management accountants? Defend your answer.

Exercises

L01 Management Accounting Versus Financial Accounting

E 1. Explain this statement: "It is impossible to distinguish the point at which financial accounting ends and management accounting begins."

L01 Management Accounting

E 2. In 1982, the IMA defined management accounting as follows:

The process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial information used by management to plan, evaluate, and control within the organization and to assure appropriate use of and accountability for its resources.⁹

Compare this definition with the updated one that appears in LO 1. How has the emphasis changed?

L01 The Management Process

E 3. Indicate whether each of the following management activities in a community hospital is part of planning (PL), performing (PE), evaluating (E), or communicating (C):

1. Leasing five ambulances for the current year
2. Comparing the actual number with the planned number of patient days in the hospital for the year
3. Developing a strategic plan for a new pediatric wing
4. Preparing a report showing the past performance of the emergency room
5. Developing standards, or expectations, for performance in the hospital admittance area for next year
6. Preparing the hospital's balance sheet and income statement and distributing them to the board of directors
7. Maintaining an inventory of bed linens and bath towels
8. Formulating a corporate policy for the treatment and final disposition of hazardous waste materials
9. Preparing a report on the types and amounts of hazardous waste materials removed from the hospital in the last three months
10. Recording the time taken to deliver food trays to patients

L01 Report Preparation

E 4. John Jefferson is the sales manager for Sunny Greeting Cards, Inc. At the beginning of the year, the organization introduced a new line of humorous birthday cards to the U.S. market. Management held a strategic planning meeting on August 31 to discuss next year's operating activities. One item on the agenda was

to review the success of the new line of cards and decide if there was a need to change the selling price or to stimulate sales volume in the five sales territories. Jefferson was asked to prepare a report addressing those issues and to present it at the meeting. His report was to include the profits generated in each sales territory by the new card line only.

On August 31, Jefferson arrived at the meeting late and immediately distributed his report to the strategic planning team. The report consisted of comments made by seven of Jefferson's leading sales representatives. The comments were broad in scope and touched only lightly on the success of the new card line. Jefferson was pleased that he had met the deadline for distributing the report, but the other team members were disappointed in the information he provided.

Using the four *w*'s for report presentation, comment on Jefferson's effectiveness in preparing his report.

LO1 The Supply Chain

E 5. In recent years, **United Parcel Service (UPS)** (www.ups-scs.com/solutions/casestudies.html) has been positioning itself as a solver of supply-chain issues. Visit its website and read one of the case studies related to its supply-chain solutions. Explain how UPS helped improve the supply chain of the business featured in the case.

LO1 The Planning Framework

E 6. Edward Ortez has just opened a company that imports fine ceramic gifts from Mexico and sells them over the Internet. In planning his business, Ortez did the following:

1. Listed his expected expenses and revenues for the first six months of operations
2. Decided that he wanted the company to provide him with income for a good lifestyle and funds for retirement
3. Determined that he would keep his expenses low and generate enough revenues during the first two months of operations so that he would have a positive cash flow by the third month
4. Decided to focus his business on providing customers with the finest Mexican ceramics at a favorable price
5. Developed a complete list of goals, objectives, procedures, and policies relating to how he would find, buy, store, sell, and ship goods and collect payment
6. Decided not to have a retail operation but to rely solely on the Internet to market the products
7. Decided to expand his website to include ceramics from other Central American countries over the next five years

Match each of Ortez's actions to the components of the planning framework: goal, mission, strategic objectives, tactical objectives, operating objectives, business plan, and budget.

LO2 The Value Chain

E 7. As mentioned in **E 6**, Edward Ortez recently opened his own company. He has been thinking of ways to improve the business. Here is a list of the actions that he will be undertaking:

1. Engaging an accountant to help analyze progress in meeting the objectives of the company
2. Hiring a company to handle payroll records and employee benefits
3. Developing a logo for labeling and packaging the ceramics
4. Making gift packages by placing gourmet food products in ceramic pots and wrapping them in plastic
5. Engaging an attorney to write contracts
6. Traveling to Mexico himself to arrange for the purchase of products and their shipment back to the company

7. Arranging new ways of taking orders over the Internet and shipping the products
8. Keeping track of the characteristics of customers and the number and types of products they buy
9. Following up with customers to see if they received the products and if they are happy with them
10. Arranging for an outside firm to keep the accounting records
11. Distributing brochures that display the ceramics and refer to the website

Classify each of Ortez's actions as one of the value chain's primary processes—research and development, design, supply, production, marketing, distribution, or customer service—or as a support service—human resources, legal services, information systems, or management accounting. Of the 11 actions, which are the most likely candidates for outsourcing? Why?

L01 L02 The Supply Chain and Value Chain

E 8. The items in the following list are associated with a hotel. Indicate which are part of the supply chain (S) and which are part of the value chain (V).

1. Travel agency
2. Housekeeping supplies
3. Special events and promotions
4. Customer service
5. Travel bureau website
6. Tour agencies

L01 L03 Management Reports

E 9. The reports that follow are from a grocery store. Which report would be used for financial purposes, and which would be used for activity-based decision making? Why?

Salaries	\$ 1,000	Scan grocery purchases	\$ 3,000
Equipment	2,200	Stock fruit	1,000
Freight	5,000	Bake rye bread	500
Supplies	800	Operate salad bar	2,500
Use and occupancy	1,000	Stock can goods	2,000
		Collapse cardboard boxes	1,000
Total	<u>\$10,000</u>	Total	<u>\$10,000</u>

L02 The Value Chain

E 10. As shown in the data that follow, a producer of ceiling fans has determined the unit cost of its most popular model. From these unit costs, determine the total cost per unit of primary processes and the total cost per unit of support services.

Research and development	\$ 5.00
Human resources	4.50
Design	1.50
Supply	1.00
Legal services	0.50
Production	4.50
Marketing	2.00
Distribution	2.50
Customer service	6.50
Information systems	1.80
Management accounting	<u>0.20</u>
Total cost per unit	<u>\$30.00</u>

L03 Comparison of ABM and JIT

E 11. The following are excerpts from a conversation between two managers about their companies' management systems. Identify the manager who works for a company that emphasizes ABM and the one who works for a company that emphasizes a JIT system.

Manager 1: We try to manage our resources effectively by monitoring operating activities. We analyze all major operating activities, and we focus on reducing or eliminating the ones that don't add value to our products.

Manager 2: We're very concerned with eliminating waste. We've designed our operations to reduce the time it takes to move, store, queue, and inspect materials. We've also reduced our inventories by buying and using materials only when we need them.

L04 The Balanced Scorecard

E 12. Tim's Bargain Basement sells used goods at very low prices. Tim has developed the following business objectives:

1. To buy only the inventory that sells
2. To have repeat customers
3. To be profitable and grow
4. To keep employee turnover low

Tim also developed the following performance measures:

5. Growth in revenues and net income per quarter
6. Average unsold goods at the end of the business day as a percentage of the total goods purchased that day
7. Number of unemployment claims
8. Percentage of customers who have shopped in the store before

Match each of these objectives and performance measures with the four perspectives of the balanced scorecard: financial perspective, learning and growth perspective, internal business processes perspective, and customer perspective.

L04 The Balanced Scorecard

E 13. Your college's overall goal is to add value to the communities it serves. In light of that goal, match each of the following stakeholders' perspectives with the appropriate objective:

Perspective	Objective
1. Financial (investors)	a. Adding value means that the faculty engages in meaningful teaching and research.
2. Learning and growth (employees)	b. Adding value means that students receive their degrees in four years.
3. Internal business processes	c. Adding value means that the college has winning sports teams.
4. Customers	d. Adding value means that fund-raising campaigns are successful.

L05 Ethical Conduct

E 14. Katrina Storm went to work for NOLA Industries five years ago. She was recently promoted to cost accounting manager and now has a new boss, Vickery

Howe, the corporate controller. Last week, Storm and Howe went to a two-day professional development program on international accounting standards changes. During the first hour of the first day's program, Howe disappeared and Storm didn't see her again until the cocktail hour. The same thing happened on the second day. During the trip home, Storm asked Howe if she had enjoyed the conference. She replied: "Katrina, the golf course was excellent. You play golf. Why don't you join me during the next conference? I haven't sat in on one of those sessions in ten years. This is my R&R time. Those sessions are for the new people. My experience is enough to keep me current. Plus, I have excellent people to help me as we adjust our accounting system to the international changes being implemented."

Does Katrina Storm have an ethical dilemma? If so, what is it? What are her options? How would you solve her problem? Be prepared to defend your answer.

L05 Corporate Ethics

E 15. To answer the following questions, conduct a search of several companies' websites: (1) Does the company have an ethics statement? (2) Does it express a commitment to environmental or social issues? (3) In your opinion, is the company ethically responsible? Select one of the companies you researched and write a brief description of your findings.

Problems

L01 Report Preparation

P 1. Clothing Industries, Inc. is deciding whether to expand its line of women's clothing called Sami Pants. Sales in units of this product were 22,500, 28,900, and 36,200 in 2010, 2011, and 2012, respectively. The product has been very profitable, averaging 35 percent profit (above cost) over the three-year period. The company has 10 sales representatives covering seven states in the North. Production capacity at present is about 40,000 pants per year. There is adequate plant space for additional equipment, and the labor needed can be easily hired and trained.

The organization's management is made up of four vice presidents: the vice president of marketing, the vice president of production, the vice president of finance, and the vice president of management information systems. Each vice president is directly responsible to the president, Jefferson Henry.

Required

1. What types of information will Henry need before he can decide whether to expand the Sami Pants line?
2. Assume that one report needed to support Henry's decision is an analysis of sales, broken down by sales representative, over the past three years. How would each of the four v's pertain to this report?
3. Design a format for the report described in requirement 2.

L02 The Value Chain

P 2. Reigle Electronics is a manufacturer of cell phones, a highly competitive business. Reigle's phones carry a price of \$99, but competition forces the company to offer significant discounts and rebates. As a result, the average price of Reigle's cell phones has dropped to around \$50, and the company is losing money. Management is applying value chain analysis to the company's operations in an effort to

reduce costs and improve product quality. A study by the company's management accountant has determined the following per unit costs for primary processes:

Primary Process	Cost per Unit
Research and development	\$ 2.50
Design	3.50
Supply	4.50
Production	6.70
Marketing	8.00
Distribution	1.90
Customer service	<u>0.50</u>
Total cost	<u>\$27.60</u>

To generate a gross margin large enough for the company to cover its overhead costs and earn a profit, Reigle must lower its total cost per unit for primary processes to no more than \$20. After analyzing operations, management reached the following conclusions about primary processes:

- Research and development and design are critical functions because the market and competition require constant development of new features with “cool” designs at lower cost. Nevertheless, management feels that the cost per unit of these processes must be reduced by 10 percent.
- Six different suppliers currently provide the components for the cell phones. Ordering these components from just two suppliers and negotiating lower prices could result in a savings of 15 percent.
- The cell phones are currently manufactured in Mexico. By shifting production to China, the unit cost of production can be lowered by 20 percent.
- Most cell phones are sold through wireless communication companies that are trying to attract new customers with low-priced cell phones. Management believes that these companies should bear more of the marketing costs and that it is feasible to renegotiate its marketing arrangements with them so that they will bear 35 percent of the current marketing costs.
- Distribution costs are already very low, but management will set a target of reducing the cost per unit by 10 percent.
- Customer service is a weakness of the company and has resulted in lost sales. Management therefore proposes increasing the cost per unit of customer service by 50 percent.

Required

1. Prepare a table showing the current cost per unit of primary processes and the projected cost per unit based on management's proposals for cost reduction.
2. Will management's proposals for cost reduction achieve the targeted total cost per unit? What further steps should management take to reduce costs? Which steps that management is proposing do you believe will be the most difficult to accomplish?
3. What are the company's support services? What role should these services play in the value chain analysis?

Manager insight ►

Manager insight ►

L02 The Value Chain and Core Competency

P 3. Medic Products Company (MPC) is known for developing innovative and high-quality products for use in hospitals and medical and dental offices. Its latest product is a nonporous, tough, and very thin disposable glove that will not leak or split and molds tightly to the hand, making it ideal for use in medical and dental procedures. MPC buys the material it uses in making the gloves from another company, which manufactures it according to MPC's exact specifications

and quality standards. MPC makes two models of the glove—one white and one transparent—in its own plant and sells them through independent agents who represent various manufacturers. When an agent informs MPC of a sale, MPC ships the order directly to the buyer. MPC advertises the gloves in professional journals and gives free samples to physicians and dentists. It provides a product warranty and periodically surveys users about the product's quality.

Required

1. Briefly explain how MPC accomplishes each of the primary processes in the value chain.
2. What is a core competency? Which one of the primary processes would you say is MPC's core competency? Explain your choice.

LO4 The Balanced Scorecard and Benchmarking

P 4. Howski Associates is an independent insurance agency that sells business, automobile, home, and life insurance. Maya Howski, senior partner of the agency, recently attended a workshop at the local university in which the balanced scorecard was presented as a way of focusing all of a company's functions on its mission. After the workshop, she met with her managers in a weekend brainstorming session. The group determined that Howski Associates' mission was to provide high-quality, innovative, risk-protection services to individuals and businesses. To ensure that the agency would fulfill this mission, the group established the following objectives:

- To provide a sufficient return on investment by increasing sales and maintaining the liquidity needed to support operations
- To add value to the agency's services by training employees to be knowledgeable and competent
- To retain customers and attract new customers
- To operate an efficient and cost-effective office support system for customer agents

To determine the agency's progress in meeting these objectives, the group established the following performance measures:

- Number of new ideas for customer insurance
- Percentage of customers who rate services as excellent
- Average time for processing insurance applications
- Number of dollars spent on training
- Growth in revenues for each type of insurance
- Average time for processing claims
- Percentage of employees who complete 40 hours of training during the year
- Percentage of new customer leads that result in sales
- Cash flow
- Number of customer complaints
- Return on assets
- Percentage of customers who renew policies
- Percentage of revenue devoted to office support system (information systems, accounting, orders, and claims processing)

Required

1. Prepare a balanced scorecard for Howski Associates by stating the agency's mission and matching its four objectives to the four stakeholder perspectives: the financial, learning and growth, internal business processes, and customer perspectives. Indicate which of the agency's performance measures would be appropriate for each objective.

- Manager insight ►** 2. Howski Associates is a member of an association of independent insurance agents that provides industry statistics about many aspects of operating an insurance agency. What is benchmarking, and in what ways would the industry statistics assist Howski Associates in further developing its balanced scorecard?

LO5 Professional Ethics

P 5. Taylor Zimmer is the controller for Value Corporation. He has been with the company for 17 years and is being considered for the job of chief financial officer. His boss, who is the current chief financial officer and former company controller, will be Value Corporation's new president. Zimmer has just discussed the year-end closing with his boss, who made the following statement during their conversation: "Taylor, why are you being so inflexible? I'm only asking you to postpone the \$2,500,000 write-off of obsolete inventory for 10 days so that it won't appear on this year's financial statements. Ten days! Do it. Your promotion is coming up, you know. Make sure you keep all the possible outcomes in mind as you complete your year-end work. Oh, and keep this conversation confidential—just between you and me. Okay?"

Required

1. Identify the ethical issue or issues involved.
2. What do you believe is the appropriate solution to the problem? Be prepared to defend your answer.

Alternate Problems

LO1 Report Preparation

P 6. Daisy Flowers recently purchased Yardworks, Inc., a wholesale distributor of equipment and supplies for lawn and garden care. The organization, which is headquartered in Baltimore, has four distribution centers that service 14 eastern states. The centers are located in Boston, Massachusetts; Rye, New York; Reston, Virginia; and Lawrenceville, New Jersey. The company's profits for 2010, 2011, and 2012 were \$225,400, \$337,980, and \$467,200, respectively.

Shortly after purchasing the organization, Flowers appointed people to the following positions: vice president, marketing; vice president, distribution; corporate controller; and vice president, research and development. Flowers called a meeting of this management group. She wants to create a deluxe retail lawn and garden center that would include a large, fully landscaped plant and tree nursery. The purposes of the retail center would be (1) to test equipment and supplies before selecting them for sales and distribution and (2) to showcase the effects of using the company's products. The retail center must also make a profit on sales.

Required

1. What types of information will Flowers need before deciding whether to create the retail lawn and garden center?
2. To support her decision, Flowers will need a report from the vice president of research and development analyzing all possible plants and trees that could be planted and their ability to grow in the places where the new retail center might be located. How would each of the four *m*'s pertain to this report?
3. Design a format for the report in requirement 2.

LO2 The Value Chain

P 7. Soft Spot is a manufacturer of futon mattresses. Soft Spot's mattresses are priced at \$60, but competition forces the company to offer significant discounts

and rebates. As a result, the average price of the futon mattress has dropped to around \$50, and the company is losing money. Management is applying value chain analysis to the company's operations in an effort to reduce costs and improve product quality. A study by the company's management accountant has determined the following per unit costs for primary processes and support services:

Primary Process	Cost per Unit
Research and development	\$ 5.00
Design	3.00
Supply	4.00
Production	16.00
Marketing	6.00
Distribution	7.00
Customer service	1.00
Total cost per unit	<u>\$42.00</u>
Support Service	
Human resources	\$ 2.00
Information services	5.00
Management accounting	1.00
Total cost per unit	<u>\$ 8.00</u>

To generate a gross margin large enough for the company to cover its overhead costs and earn a profit, Soft Spot must lower its total cost per unit for primary processes to no more than \$32.00 and its support services to no more than \$5.00. After analyzing operations, management reached the following conclusions about primary processes and support services:

- Research and development and design are critical functions because the market and competition require constant development of new features with “cool” designs at lower cost. Nevertheless, management feels that the cost per unit of these processes must be reduced by 20 percent.
- Ten different suppliers currently provide the components for the futons. Ordering these components from just two suppliers and negotiating lower prices could result in a savings of 15 percent.
- The futons are currently manufactured in Mali. By shifting production to China, the unit cost of production can be lowered by 40 percent.
- Management believes that by selling to large retailers like **Wal-Mart** it is feasible to lower current marketing costs by 25 percent.
- Distribution costs are already very low, but management will set a target of reducing the cost per unit by 10 percent.
- Customer service and support to large customers are key to keeping their business. Management therefore proposes increasing the cost per unit of customer service by 20 percent.
- By outsourcing its support services, management projects a 20 percent drop in these costs.

Required

1. Prepare a table showing the current cost per unit of primary processes and support services and the projected cost per unit based on management's proposals.
2. Will management's proposals achieve the targeted total cost per unit? What further steps should management take to reduce costs?
3. What role should the company's support services play in the value chain analysis?

Manager insight ►

Manager insight ►

LO2 The Value Chain and Core Competency

P 8. Sports Products Company (SPC) is known for developing innovative high-quality shoes for lacrosse. Its latest patented product is a tough, all-weather, and very flexible shoe. SPC buys the material it uses in making the shoes from another company, which manufactures it according to SPC's exact specifications and quality standards. SPC makes two models of the shoe—one white and one black—in its own plant. SPC sells them through independent distributors who represent various manufacturers. When a distributor informs SPC of a sale, SPC ships the order directly to the buyer. SPC advertises the shoes in sports magazines and gives free samples to well-known lacrosse players who endorse its products. It provides a product warranty and periodically surveys users about the product's quality.

Required

1. Briefly explain how SPC accomplishes each of the primary processes in the value chain.
2. What is a core competency? Which one of the primary processes would you say is SPC's core competency? Explain your choice.

LO4 The Balanced Scorecard and Benchmarking

P 9. Resource College is a liberal arts school that provides local residents the opportunity to take college courses and earn bachelor's degrees. Yolanda Howard, the school's provost, recently attended a workshop in which the balanced scorecard was presented as a way of focusing all of an organization's functions on its mission. After the workshop, she met with her administrative staff and college deans in a weekend brainstorming session. The group determined that the college's mission was to provide high-quality courses and degrees to individuals to add value to their lives. To ensure that the college would fulfill this mission, the group established the following objectives:

- To provide a sufficient return on investment by increasing tuition revenues and maintaining the liquidity needed to support operations
- To add value to the college's courses by encouraging faculty to be life-long learners
- To retain students and attract new students
- To operate efficient and cost-effective student support systems

To determine the college's progress in meeting these objectives, the group established the following performance measures:

- Number of faculty publications
- Percentage of students who rate college as excellent
- Average time for processing student applications
- Number of dollars spent on professional development
- Growth in revenues for each department
- Average time for processing transcript requests
- Percentage of faculty who annually do 40 hours of professional development
- Percentage of new student leads that result in enrollment
- Cash flow
- Number of student complaints
- Return on assets
- Percentage of returning students
- Percentage of revenue devoted to student services systems (registrar, computer services, financial aid, and student health)

Required

1. Prepare a balanced scorecard for Resource College by stating the college's mission and matching its four objectives to the four stakeholder perspectives: the financial, learning and growth, internal business processes, and customer perspectives.
2. Indicate which of the college's performance measures would be appropriate for each objective.

LO3 LO5 Ethics and JIT Implementation

P 10. For almost a year, WEST Company has been changing its manufacturing process from a traditional to a JIT approach. Management has asked for employees' assistance in the transition and has offered bonuses for suggestions that cut time from the production operation. Don Hanley and Jerome Obbo each identified a time-saving opportunity and turned in their suggestions to their manager, Sam Knightly.

Knightly sent the suggestions to the committee charged with reviewing employees' suggestions, which inadvertently identified them as being Knightly's own. The committee decided that the two suggestions were worthy of reward and voted a large bonus for Knightly. When notified of this, Knightly could not bring himself to identify the true authors of the suggestions.

When Hanley and Obbo heard about Knightly's bonus, they confronted him with his fraudulent act and expressed their grievances. He told them that he needed the recognition to be eligible for an upcoming promotion and promised that if they kept quiet about the matter, he would make sure that they both received significant raises.

Required

1. Should Hanley and Obbo keep quiet? What other options are open to them?
2. How should Knightly have dealt with Hanley's and Obbo's complaints?

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 Management Information

C 1. Obtain a copy of a recent annual report of a publicly held organization in which you have a particular interest. (Copies of annual reports are available at your campus library, at a local public library, on the Internet, or by direct request to an organization.) Assume that you have just been appointed to a middle-management position in a division of the organization you have chosen. You are interested in obtaining information that will help you better manage the activities of your division, and you have decided to study the contents of the annual report in an attempt to learn as much as possible.

You particularly want to know about the following: (1) size of inventory maintained; (2) ability to earn income; (3) reliance on debt financing; (4) types, volume, and prices of products or services sold; (5) type of production process used; (6) management's long-range strategies; (7) success (profitability) of the division's various product lines; (8) efficiency of operations; and (9) operating details of your division.

1. Write a brief description of the organization and its products or services and activities.
2. Based on a review of the financial statements and the accompanying disclosure notes, prepare a written summary of information pertaining to items 1 through 9 above.

3. Can you find any of the information in which you are interested in other sections of the annual report? If so, which information, and in which sections of the report is it?
4. The annual report also includes other types of information that you may find helpful in your new position. In outline form, summarize this additional information.

LO1 Management Information Needs

C 2. In **C 1**, you examined your new employer's annual report and found some useful information. However, you are interested in knowing whether your division's products or services are competitive, and you were unable to find the necessary information in the annual report.

1. What kinds of information about your competition do you want to find?
2. Why is this information relevant? (Link your response to a particular decision about your organization's products or services. For example, you might seek information to help you determine a new selling price.)
3. From what sources could you obtain the information you need?
4. When would you want to obtain this information?
5. Create a report that will communicate your findings to your superior.

LO1 Report Preparation

C 3. The registrar's office of Mainland College is responsible for maintaining a record of each student's grades and credits for use by students, instructors, and administrators.

1. Assume that you are a manager in the registrar's office and that you recently joined a team of managers to review the grade-reporting process. Explain how you would prepare a report of grades for students' use and the same report for instructors' use by answering the following questions:
 - a. Who will read the grade report?
 - b. Why is the grade report necessary?
 - c. What information should the grade report contain?
 - d. When is the grade report due?
2. Why does the information in a grade report for students' use and in a grade report for instructors' use differ?
3. Visit the registrar's office of your school in person or through your school's website. Obtain a copy of your grade report and a copy of the form that the registrar's office uses to report grades to instructors. Compare the information that these reports supply with the information you listed in question 1. Explain any differences.
4. What can the registrar's office do to make sure that its grade reports are effective in communicating all necessary information to readers?

LO4 Management Information Needs

C 4. **McDonald's** is a leading competitor in the fast-food restaurant business. One component of McDonald's marketing strategy is to increase sales by expanding its foreign markets. At present, McDonald's restaurants operate in over 100 countries. In making decisions about opening restaurants in foreign markets, the company uses quantitative and qualitative financial and nonfinancial information. The following types of information would be important to such a decision: the cost of a new building (quantitative financial information), the estimated number of hamburgers to be sold in the first year (quantitative nonfinancial information), and site desirability (qualitative information).

Suppose you are a member of McDonald's management team that must decide whether to open a new restaurant in England. Identify at least two examples each of the (a) quantitative financial, (b) quantitative nonfinancial, and (c) qualitative information that you will need before you can make a decision.

L01 L04 Performance Measures and the Balanced Scorecard

C 5. Working in a group of four to six students, select a local business. The group should become familiar with the background of the business by interviewing its manager or accountant. Each group member should identify several performance objectives for the business and link each objective with a specific stakeholder's perspective from the balanced scorecard. (Select at least one performance objective for each perspective.) For each objective, ask yourself, "If I were the manager of the business, how would I set performance measures for each objective?" Then prepare an email stating the business's name, location, and activities and your linked performance objective and perspectives. Also list possible measures for each performance objective.

In class, members of the group should compare their individual emails and compile them into a group report by having each group member assume a different stakeholder perspective (add government and community if you want more than four perspectives). Each group should be ready to present all perspectives and the group's report on performance objectives and measures in class.

L01 L03 Cookie Company (Continuing Case)

C 6. Each of the rest of the chapters in this text includes a "cookie company" case that shows how you could operate your own cookie business. In this chapter, you will express your company's mission statement; set strategic, tactical, and operating objectives; decide on a name for your business; and identify management tools you might consider using to run your business.

1. In researching how to start and run a cookie business, you found the following three examples of cookie company mission statements:
 - To provide cheap cookies that taste great and fast courteous service!
 - Our mission is to make the best chocolate chip cookies that you have ever tasted.
 - Handmaking the best in custom cookie creations.
 - a. Consider which of the mission statements most closely expresses what you want your company's identity and unique character to be. Why?
 - b. Will your business focus on cost, quality, or satisfying a specific need?
 - c. Write your company's mission statement.
2. Based on your mission statement, describe your broad long-term strategic objectives:
 - What will be your main products?
 - Who will be your primary customers?
 - Where will you operate your business?
3. You made the following decisions about your business:
 - To list expected expenses and revenues for the first six months of operations
 - To keep expenses low and generate enough revenues during the first two months of operations to have a positive cash flow by the third month
 - To develop a complete list of goals, objectives, procedures, and policies relating to how to find, buy, store, sell, and ship goods and collect payment
 - To rely solely on the Internet to market products
 - To expand the ecommerce website to include 20 varieties of cookies over the next five years

Match each of the above to the following components of the planning framework: strategic objectives, tactical objectives, operating objectives, business plan, and budget.

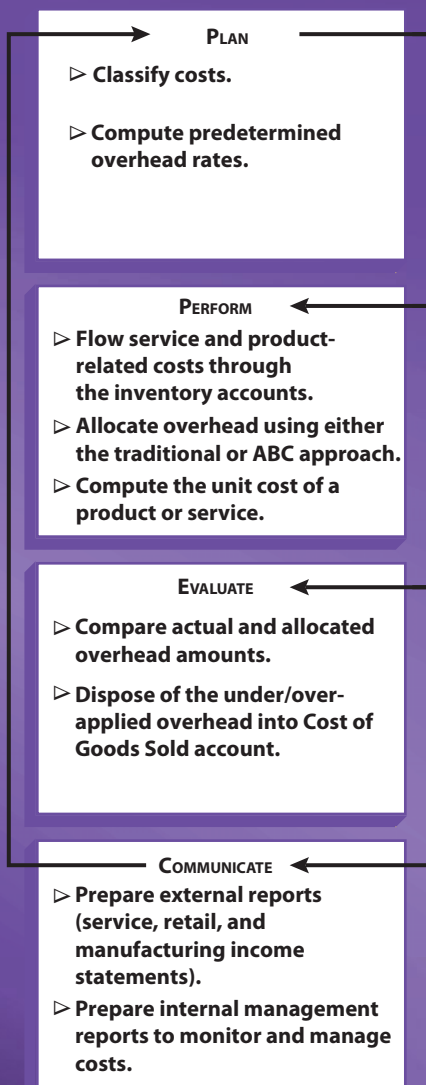
4. What will be the name of your cookie company?
5. Which of the management tools listed in the chapter might you consider using to operate your business? Why?

CHAPTER

2

Cost Concepts and Cost Allocation

The Management Process



How managers use cost information to solve, "How much does it cost?" can result in differing answers.

In this chapter, we describe how managers use information about costs, classify costs, compile product unit costs, and allocate overhead costs using the traditional method.

LEARNING OBJECTIVES

- LO1** Explain how managers classify costs and how they use these cost classifications. (pp. 46–49)
- LO2** Compare how service, retail, and manufacturing organizations report costs on their financial statements and how they account for inventories. (pp. 50–53)
- LO3** Describe the flow of costs through a manufacturer's inventory accounts. (pp. 54–58)
- LO4** Define *product unit cost*, and compute the unit cost of a product or service. (pp. 58–62)
- LO5** Define *cost allocation*, and explain how the traditional method of allocating overhead costs figures into calculating product or service unit cost. (pp. 63–68)

DECISION POINT ► A MANAGER'S FOCUS THE HERSHEY COMPANY

With net sales of \$4.9 billion, **The Hershey Company** does indeed fulfill its mission statement of “bringing sweet moments of Hershey happiness to the world everyday.” To have achieved that and to continue doing it, Hershey’s managers must know a lot about the costs of producing and selling its Reese’s, KitKat, Twizzlers, Kisses, Jolly Rancher, Ice Breakers, and other products. Go to Hershey’s website (www.Hersheys.com) to have a tour of the world’s largest chocolate factory and to view how Reese’s Peanut Butter Cups, Twizzler Twists, Mounds, Heath, or PayDay are made.

- How do managers at Hershey’s determine the cost of a candy bar?
- How do managers use cost information?



Cost Information

LO1 Explain how managers classify costs and how they use these cost classifications.

One of a company's primary goals is to be profitable. Because a company's owners expect to earn profits, managers have a responsibility to use the company's resources wisely and to generate revenues that will exceed the costs of the company's operating, investing, and financing activities. In this chapter, we focus on costs related to the operating activities of manufacturing, retail, and service organizations. We begin by looking at how managers in these different organizations use information about costs.

Managers' Use of Cost Information

Managers use information about operating costs to plan, perform, evaluate, and communicate the results of operating activities.

- ▶ Service organization managers find the estimated cost of services helpful in monitoring profitability and making decisions about such matters as bidding on future business, lowering or negotiating their fees, or dropping one of their services.
- ▶ In retail organizations, such as Good Foods Store, which we used as an example in the last chapter, managers work with the estimated cost of merchandise purchases to predict gross margin, operating income, and value of merchandise sold. They also use this information to make decisions about matters like reducing selling prices for clearance sales, lowering selling prices for bulk sales, or dropping a product line.
- ▶ Managers at manufacturing companies like **Hershey's** use estimated product costs to predict the gross margin and operating income on sales and to make decisions about such matters as dropping a product line, outsourcing the manufacture of a part to another company, bidding on a special order, or negotiating a selling price. In this chapter, we will use The Choice Candy Company, the hypothetical manufacturer of gourmet chocolate candy bars, to illustrate how managers of manufacturing companies use cost information.

Cost Information and Organizations

All organizations use cost information to determine profits and selling prices and to value inventories. Ultimately, a company is profitable only when its revenues from sales or services rendered exceed all its costs. But different types of organizations have different types of product or service costs.

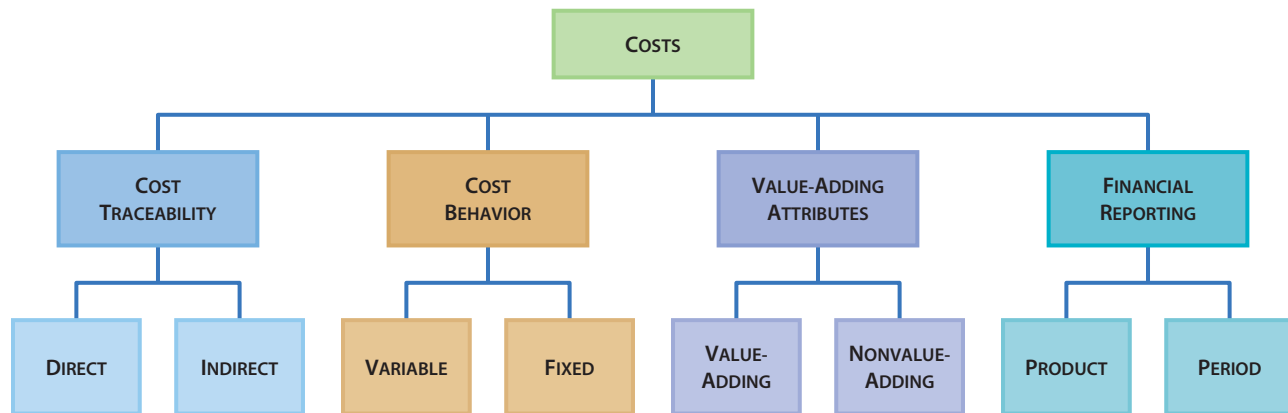
- ▶ Service organizations like **Southwest Airlines** need information about the costs of providing services, which include the costs of labor and related overhead.
- ▶ Retail organizations like **Wal-Mart** and Good Foods Store need information about the costs of purchasing products for resale. These costs include adjustments for freight-in costs, purchase returns and allowances, and purchase discounts.
- ▶ Manufacturing organizations like **Hershey's** and The Choice Candy Company need information about the costs of manufacturing products. Product costs include the costs of direct materials, direct labor, and overhead.

Cost Classifications and Their Uses

A single cost can be classified and used in several ways, depending on the purpose of the analysis. Figure 2-1 provides an overview of commonly used cost classifications. These classifications enable managers to do the following:

1. Control costs by determining which are traceable to a particular cost object, such as a service or product.
2. Calculate the number of units that must be sold to achieve a certain level of profit (cost behavior).

FIGURE 2-1 Overview of Cost Classifications



3. Identify the costs of activities that do and do not add value to a product or service.
4. Classify costs for the preparation of financial statements.

Cost Traceability

Managers trace costs to cost objects, such as products or services, sales territories, departments, or operating activities, to develop a fairly accurate measurement of costs.

- ▶ **Direct costs** are costs that can be conveniently and economically traced to a cost object. For example, the wages of workers who make candy bars can be conveniently traced to a particular batch because of time cards and payroll records. Similarly, the cost of chocolate's main ingredients—chocolate liquor, cocoa butter, sugar, and milk—can be easily traced.
- ▶ **Indirect costs** are costs that cannot be conveniently and economically traced to a cost object. Some examples include the nails used in furniture, the salt used in candy, and the rivets used in airplanes. For the sake of accuracy, however, these indirect costs must be included in the cost of a product or service. Because they are difficult to trace or an insignificant amount, management uses a formula to assign them to cost objects.

The following examples illustrate cost objects and their direct and indirect costs in service, retail, and manufacturing organizations:

- ▶ **Service organization:** In organizations such as an accounting firm, costs can be traced to a specific service, such as preparation of tax returns. Direct costs for such a service include the costs of government reporting forms, computer usage, and the accountant's labor. Indirect costs include the costs of supplies, office rental, utilities, secretarial labor, telephone usage, and depreciation of office furniture.
- ▶ **Retail organization:** Costs for organizations such as Good Foods Store can be traced to a department. For example, the direct costs of the produce department include the costs of fruits and vegetables and the wages of employees working in that department. Indirect costs include the costs of utilities to cool the produce displays and the storage and handling of the produce.
- ▶ **Manufacturing organization:** Costs for organizations such as The Choice Candy Company can be traced to the product. Direct costs include the costs

of the materials and labor needed to make the candy. Indirect costs include the costs of utilities, depreciation of plant and equipment, insurance, property taxes, inspection, supervision, maintenance of machinery, storage, and handling.

Cost Behavior

Managers are also interested in the way costs respond to changes in volume or activity. By analyzing those variable and fixed patterns of behavior, they gain information to make better management decisions.

- ▶ A **variable cost** is a cost that changes in direct proportion to a change in productive output (or some other measure of volume).
- ▶ A **fixed cost** is a cost that remains constant within a defined range of activity or time period.

All types of organizations have variable and fixed costs. Here are a few examples:

- ▶ Because the number of passengers drives the consumption of food and beverages on a flight, the cost of peanuts and beverages is a variable cost for **Southwest Airlines**. Fixed costs include the depreciation on the plane and the salaries and benefits of the flight and ground crews.
- ▶ The variable costs of Good Foods Store include the cost of groceries sold and any sales commissions. Fixed costs include the costs of building and lot rental, depreciation on store equipment, and the manager's salary.
- ▶ The variable costs of The Choice Candy Company include the costs of direct materials (e.g., sugar, cocoa), direct labor wages, indirect materials (e.g., salt), and indirect labor (e.g., inspection and maintenance labor). Fixed costs include the costs of supervisors' salaries and depreciation on buildings.

Study Note

Notice in each of these examples that as more products or services are produced and sold, the variable costs increase proportionately. Fixed costs, however, remain the same for a specified period.

Value-Adding Versus Nonvalue-Adding Costs

Costs incurred to improve the quality of a product are value-adding costs if the customer is willing to pay more for the higher-quality product or service; otherwise, they are nonvalue-adding costs because they do not increase its market value.

- ▶ A **value-adding cost** is the cost of an activity that increases the market value of a product or service.
- ▶ A **nonvalue-adding cost** is the cost of an activity that adds cost to a product or service but does not increase its market value.

Managers examine the value-adding attributes of their company's operating activities and, wherever possible, reduce or eliminate activities that do not directly add value to the company's products or services. For example, the costs of administrative activities, such as accounting and human resource management, are nonvalue-adding costs. Because they are necessary for the operation of the business, they are monitored closely but cannot be eliminated.

Cost Classifications for Financial Reporting

For purposes of preparing financial statements, managers classify costs as product costs or period costs.

- ▶ **Product costs**, or *inventoriable* costs, are costs assigned to inventory; they include direct materials, direct labor, and overhead. Product costs appear on the income statement as cost of goods sold and on the balance sheet as inventory.

Study Note

Product costs and period costs can be explained by using the matching rule. Product costs must be charged to the period in which the product generates revenue, and period costs are charged against the revenue of the current period.

TABLE 2-1 Examples of Cost Classifications for a Candy Manufacturer

Cost Examples	Traceability to Product	Cost Behavior	Value Attribute	Financial Reporting
Sugar for candy	Direct	Variable	Value-adding	Product (direct materials)
Labor for mixing	Direct	Variable	Value-adding	Product (direct labor)
Labor for supervision	Indirect	Fixed	Nonvalue-adding	Product (overhead)
Depreciation on mixing machine	Indirect	Fixed	Value-adding	Product (overhead)
Sales commission	—*	Variable	Value-adding [†]	Period
Accountant’s salary	—*	Fixed	Nonvalue-adding	Period

*Sales commissions and accountants’ salaries cannot be directly or indirectly traced to a cost object; they are not product costs.
[†]Sales commissions can be value-adding because customers’ perceptions of the salesperson and the selling experience can strongly affect their perceptions of the product’s market value.

► **Period costs**, or *noninventoriable* costs, are costs of resources used during the accounting period that are not assigned to products. They appear as operating expenses on the income statement. For example, among the period costs listed on the income statement are selling, administrative, and general expenses.

Table 2-1 shows how some costs of a candy manufacturer can be classified in terms of traceability, behavior, value attribute, and financial reporting.

STOP & APPLY >

Indicate whether each of the following costs for a gourmet chocolate candy maker is a product or a period cost, a variable or a fixed cost, a value-adding or a nonvalue-adding cost, and, if it is a product cost, a direct or an indirect cost of the candy:

Cost Classification			
Product or Period	Variable or Fixed	Value-Adding or Nonvalue-Adding	Direct or Indirect
Product	Variable	Value-adding	Direct
1. Chocolate		4. Dishwasher wages	
2. Office rent		5. Pinch of salt	
3. Candy chef wages		6. Utilities to run mixer	

SOLUTION

Cost Classification				
	Product or Period	Variable or Fixed	Value-Adding or Nonvalue-Adding	Direct or Indirect
Chocolate	Product	Variable	Value-adding	Direct
Office rent	Period	Fixed	Nonvalue-adding	—
Candy chef wages	Product	Variable	Value-adding	Direct
Dishwasher wages	Product	Variable	Value-adding	Indirect
Pinch of salt	Product	Variable	Value-adding	Indirect
Utilities to run mixer	Product	Variable	Value-adding	Indirect

Financial Statements and the Reporting of Costs

LO2 Compare how service, retail, and manufacturing organizations report costs on their financial statements and how they account for inventories.

Managers prepare financial statements at least once a year to communicate the results of their management activities for the period. The key to preparing an income statement or a balance sheet in any kind of organization is determining its cost of goods or services sold and the value of its inventories, if any.

Income Statement and Accounting for Inventories

Remember that all organizations—service, retail, and manufacturing—use the following income statement format:

$$\text{Sales} - \begin{array}{c} \text{Cost of Sales} \\ \text{or} \\ \text{Cost of Goods Sold} \end{array} = \text{Gross Margin} - \text{Operating Expenses} = \text{Operating Income}$$

Figure 2-2 compares the financial statements of service, retail, and manufacturing organizations. Note in particular the differences in inventory accounts and cost of goods sold. As pointed out earlier, product costs, or inventoriable costs, appear as inventory on the balance sheet and as cost of goods sold on the income statement. Period costs, also called *noninventoriable costs* or *selling, administrative, and general expenses*, are reflected in the operating expenses on the income statement.

Because the operations of service and retail organizations differ from those of manufacturers, the accounts presented in their financial statements differ as well.

- ▶ Service organizations like **Southwest Airlines** and **United Parcel Service (UPS)** sell services and not products; they maintain no inventories for sale or resale. As a result, unlike manufacturing and retail organizations, they have no inventory accounts on their balance sheets.

Suppose that Good Foods Store, the retail shop that we used as an example in the last chapter, employs UPS to deliver its products. The cost of sales for UPS would include the wages and salaries of personnel plus the expense of the trucks, planes, supplies, and anything else that UPS uses to deliver packages for Good Foods Store.

- ▶ Retail organizations, such as **Wal-Mart** and Good Foods Store, which purchase products ready for resale, maintain just one inventory account on the balance sheet. Called the Merchandise Inventory account, it reflects the costs of goods held for resale.

Suppose that Good Foods Store had a balance of \$3,000 in its Merchandise Inventory account at the beginning of the year. During the year, its purchases of food products totaled \$23,000 (adjusted for purchase discounts, returns and allowances, and freight-in). At year-end, its Merchandise Inventory balance was \$4,500. The cost of goods sold was thus \$21,500.

- ▶ Manufacturing organizations like The Choice Candy Company, which make products for sale, maintain three inventory accounts on the balance sheet: the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts. The Materials Inventory account shows the cost of materials that have been purchased but not used in the production process. During the production process, the costs of manufacturing the product are accumulated in the Work in Process Inventory account; the balance of this account represents the costs of the unfinished product. Once the product is complete and ready for sale, its cost is transferred to the Finished Goods Inventory account; the balance in this account is the cost of the unsold completed product.

FIGURE 2-2 Financial Statements of Service, Retail, and Manufacturing Organizations

	Service Company	Retail Company	Manufacturing Company
Income Statement	Sales – <u>Cost of sales</u> = Gross margin – <u>Operating expenses</u> = <u>Operating income</u>	Sales – <u>Cost of goods sold*</u> = Gross margin – <u>Operating expenses</u> = <u>Operating income</u> *Cost of goods sold: Beginning merchandise inventory + <u>Net cost of purchases</u> = Cost of goods available for sale – <u>Ending merchandise inventory</u> = <u>Cost of goods sold</u>	Sales – <u>Cost of goods sold†</u> = Gross margin – <u>Operating expenses</u> = <u>Operating income</u> †Cost of goods sold: Beginning finished goods inventory + <u>Cost of goods manufactured</u> = Cost of goods available for sale – <u>Ending finished goods inventory</u> = <u>Cost of goods sold</u>
Balance Sheet (current assets section)	No inventory accounts	One inventory account: Merchandise Inventory (finished product ready for sale)	Three inventory accounts: Materials Inventory (unused materials) Work in Process Inventory (unfinished product) Finished Goods Inventory (finished product ready for sale)
Example with numbers		Income Statement: Beg. merchandise inventory \$ 3,000 + <u>Net cost of purchases</u> 23,000 = Cost of goods available for sale \$26,000 – <u>End. merchandise inventory</u> 4,500 = <u>Cost of goods sold</u> \$21,500 Balance Sheet: Merchandise inventory, ending \$ 4,500	Income Statement: Beg. finished goods inventory \$ 52,000 + <u>Cost of goods manufactured</u> 144,000 = Cost of goods available for sale \$196,000 – <u>End. finished goods inventory</u> 78,000 = <u>Cost of goods sold</u> \$118,000 Balance Sheet: Finished goods inventory, ending \$ 78,000

Suppose that The Choice Candy Company had a balance of \$52,000 in its Finished Goods Inventory account at the beginning of the year. During the year, the cost of the products that the company manufactured totaled \$144,000. At year end, its Finished Goods Inventory balance was \$78,000. The cost of goods sold was thus \$118,000.

Statement of Cost of Goods Manufactured

The key to preparing an income statement for a manufacturing organization is computing its cost of goods sold, which means that you must first determine the cost of goods manufactured. This dollar amount is calculated on the **statement of cost of goods manufactured**, a special report based on an analysis of the Work in Process Inventory account. At the end of an accounting period, the flow of all manufacturing costs incurred during the period is summarized in this statement. Exhibit 2-1 shows The Choice Candy Company's statement of cost of goods manufactured for the year.

It is helpful to think of the statement of cost of goods manufactured as being developed in three steps:

- Step 1.** *Compute the cost of direct materials used during the accounting period.* As shown in Exhibit 2-1, add the beginning balance in the Materials Inventory account to the direct materials purchased. The subtotal

(\$300,000) represents the cost of direct materials available for use during the accounting period. Next, subtract the ending balance of the Materials Inventory account from the cost of direct materials available for use. The difference is the cost of direct materials used during the period.

Step 2. *Calculate total manufacturing costs for the period.* As shown in Exhibit 2-1, the costs of direct materials used and direct labor are added to total overhead costs incurred during the period to arrive at total manufacturing costs.

Step 3. *Determine total cost of goods manufactured for the period.* As shown in Exhibit 2-1, add the beginning balance in the Work in Process Inventory account to total manufacturing costs to arrive at the total cost of work in process during the period. From this amount, subtract the ending balance in the Work in Process Inventory account to arrive at the cost of goods manufactured.

Study Note

An alternative to the cost of goods manufactured calculation uses the cost flow concept that is discussed in LO3.

EXHIBIT 2-1

Statement of Cost of Goods Manufactured and Partial Income Statement for a Manufacturing Organization

The Choice Candy Company		
Statement of Cost of Goods Manufactured		
For the Year 2011		
Direct materials used		
Beginning materials inventory	\$100,000	
Direct materials purchased	<u>200,000</u>	
Cost of direct materials available for use	\$300,000	
Less ending materials inventory	<u>50,000</u>	
Step 1: Cost of direct materials used		\$250,000
Direct labor		120,000
Overhead		<u>60,000</u>
Step 2: Total manufacturing costs		\$430,000
Add beginning work in process inventory		<u>20,000</u>
Total cost of work in process during the year		\$450,000
Less ending work in process Inventory		<u>150,000</u>
Step 3: Cost of goods manufactured		<u>\$300,000</u>

The Choice Candy Company		
Income Statement		
For the Year 2011		
Sales		\$500,000
Cost of goods sold		
Beginning finished goods inventory	\$ 78,000	
Cost of goods manufactured	<u>300,000</u>	
Cost of goods available for sale	\$378,000	
Less ending finished goods inventory	<u>138,000</u>	
Cost of goods sold		<u>240,000</u>
Gross margin		\$260,000
Selling and administrative expenses		<u>160,000</u>
Operating income		<u>\$100,000</u>

Cost of Goods Sold and a Manufacturer's Income Statement

Study Note

It is important not to confuse the cost of goods manufactured with the cost of goods sold.

Exhibit 2-1 shows the relationship between The Choice Candy Company's income statement and its statement of cost of goods manufactured. The total amount of the cost of goods manufactured during the period is carried over to the income statement, where it is used to compute the cost of goods sold. The beginning balance of the Finished Goods Inventory account is added to the cost of goods manufactured to arrive at the total cost of goods available for sale during the period. The cost of goods sold is then computed by subtracting the ending balance in Finished Goods Inventory (what was not sold) from the total cost of goods available for sale (what was available for sale). The cost of goods sold is considered an expense in the period in which the goods are sold.

STOP & APPLY >

Given the following information, compute the ending balances of the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts:

Materials inventory, beginning balance	\$ 230
Work in process inventory, beginning balance	250
Finished goods inventory, beginning balance	380
Direct materials purchased	850
Direct materials placed into production	740
Direct labor costs	970
Overhead costs	350
Cost of goods completed	1,230
Cost of goods sold	935

SOLUTION

Materials Inventory, ending balance:

Materials Inventory, beginning balance	\$ 230
Direct materials purchased	850
Direct materials placed into production	(740)
Materials Inventory, ending balance	<u>\$ 340</u>

Work in Process Inventory, ending balance:

Work in Process Inventory, beginning balance	\$ 250
Direct materials placed into production	740
Direct labor costs	970
Overhead costs	350
Cost of goods completed	(1,230)
Work in Process Inventory, ending balance	<u>\$1,080</u>

Finished Goods Inventory, ending balance:

Finished Goods Inventory, beginning balance	\$ 380
Cost of goods completed	1,230
Cost of goods sold	(935)
Finished Goods Inventory, ending balance	<u>\$ 675</u>

Inventory Accounts in Manufacturing Organizations

LO3 Describe the flow of costs through a manufacturer's inventory accounts.

Transforming materials into finished products ready for sale requires a number of production and production-related activities. A manufacturing organization's accounting system tracks these activities as product costs flowing through the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts.

- ▶ The **Materials Inventory account** shows the balance of the cost of unused materials.
- ▶ The **Work in Process Inventory account** shows the manufacturing costs that have been incurred and assigned to partially completed units of product.
- ▶ The **Finished Goods Inventory account** shows the costs assigned to all completed products that have not been sold.

Document Flows and Cost Flows Through the Inventory Accounts

Managers accumulate and report manufacturing costs based on documents pertaining to production and production-related activities. Figure 2-3 summarizes the typical relationships among the production activities, the documents for each of the three cost elements, and the inventory accounts affected by the activities. Looking at the relationship between activities and documents provides insight into how costs flow through the three inventory accounts and when an activity must be recorded in the accounting records.

To illustrate document flow and changes in inventory balances for production activities in Figure 2-3, we continue with our example of The Choice Candy Company, a typical manufacturing business.

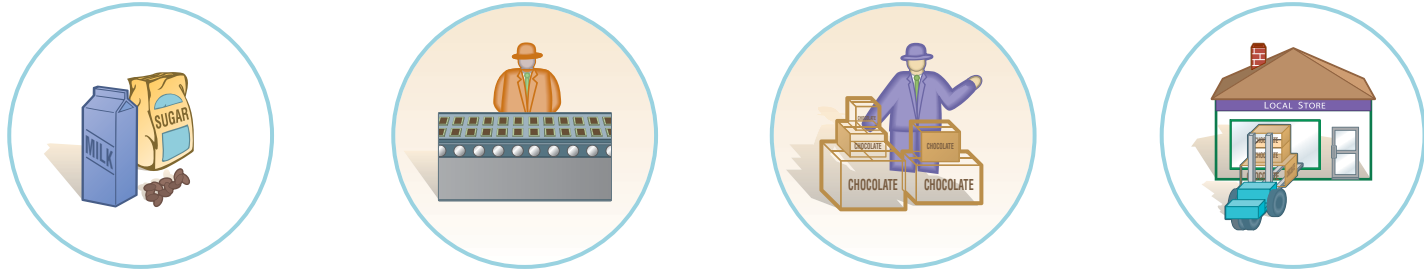
Purchase of Materials

- ▶ The purchasing process starts with a *purchase request* prepared on a computer form which is submitted electronically for specific quantities of materials needed in the manufacturing process but not currently available in the materials storeroom. A qualified manager approves the request online. Based on the information in the purchase request, the Purchasing Department prepares a computer-generated *purchase order* and sends it to a supplier.
- ▶ When the materials arrive, an employee on the receiving dock examines the materials and enters the information into the company database as a *receiving report*. The system matches the information on the receiving report with the descriptions and quantities listed on the purchase order. A materials handler moves the newly arrived materials from the receiving area to the materials storeroom.
- ▶ The Choice Candy Company's accounting department receives a *vendor's invoice* from the supplier requesting payment for the purchased materials. The cost of those materials increases the balance of the Materials Inventory account and an account payable is recognized. If all documents match, payment is authorized to be made.

Production of Goods

- ▶ When candy bars are scheduled for production, the storeroom clerk receives a *materials request form*. In addition to showing authorization, it describes the types and quantities of materials that the storeroom clerk is to send to the production area, and it authorizes the release of those materials from the materials inventory into production.

FIGURE 2-3 Activities, Documents, and Cost Flows Through the Inventory Accounts of a Manufacturing Organization



	PURCHASE OF MATERIALS	PRODUCTION OF GOODS	PRODUCT COMPLETION	PRODUCT SALE								
ACTIVITIES	<ul style="list-style-type: none"> • Purchase, receive, inspect, and store materials. • Confirm receipt of materials. • Match documents. 	<ul style="list-style-type: none"> • Move materials to production area. • Convert materials into finished product using direct labor and overhead. 	<ul style="list-style-type: none"> • Move completed products to finished goods storage area and store until sold. • Move sold units to shipping. 	<ul style="list-style-type: none"> • Ship products sold to customer. 								
DOCUMENTS	<ul style="list-style-type: none"> • Purchase request • Purchase order • Receiving report • Vendor's invoice 	<ul style="list-style-type: none"> • Materials request form • Time card • Job order cost card 	<ul style="list-style-type: none"> • Job order cost card 	<ul style="list-style-type: none"> • Sales invoice • Shipping document • Job order cost card 								
INVENTORY ACCOUNTS (RELATED DOCUMENTS)	<p style="text-align: center;">MATERIALS INVENTORY</p> <hr/> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 5px;">Cost of materials purchased (vendor's invoice)</td> <td style="padding: 5px;">Cost of materials used in production (materials request form)</td> </tr> </table>	Cost of materials purchased (vendor's invoice)	Cost of materials used in production (materials request form)	<p style="text-align: center;">WORK IN PROCESS INVENTORY</p> <hr/> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 5px;">Cost of materials used in production (materials request form) Cost of direct labor (time card) Cost of overhead</td> <td style="padding: 5px;">Cost of completed products (job order cost card)</td> </tr> </table>	Cost of materials used in production (materials request form) Cost of direct labor (time card) Cost of overhead	Cost of completed products (job order cost card)	<p style="text-align: center;">FINISHED GOODS INVENTORY</p> <hr/> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 5px;">Cost of completed products (job order cost card)</td> <td style="padding: 5px;">Cost of sold units (job order cost card)</td> </tr> </table>	Cost of completed products (job order cost card)	Cost of sold units (job order cost card)	<p style="text-align: center;">COST OF GOODS SOLD</p> <hr/> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 5px;">Cost of sold units (job order cost card)</td> <td style="padding: 5px;"></td> </tr> </table>	Cost of sold units (job order cost card)	
Cost of materials purchased (vendor's invoice)	Cost of materials used in production (materials request form)											
Cost of materials used in production (materials request form) Cost of direct labor (time card) Cost of overhead	Cost of completed products (job order cost card)											
Cost of completed products (job order cost card)	Cost of sold units (job order cost card)											
Cost of sold units (job order cost card)												

- ▶ If all is in order, the storeroom clerk has the materials handler move the materials to the production floor.
 - ▶ The cost of the direct materials transferred will increase the balance of the Work in Process Inventory account and decrease the balance of the Materials Inventory account.
 - ▶ The cost of the indirect materials transferred will increase the balance of the Overhead account and decrease the balance of the Materials Inventory account. (We discuss overhead in more detail later in this chapter.)
- ▶ Each of the production employees who make the candy bars prepares a *time card* to record the number of hours he or she has worked on this and other orders each day.
 - ▶ The costs of the direct labor used to manufacture the candy bars increase the balance of the Work in Process Inventory account.
 - ▶ The costs of the indirect labor used to support the manufacture of the candy bars increase the balance of the Overhead account.
- ▶ A *job order cost card* can be used to record all direct material, direct labor, and overhead costs incurred as the products move through production.

Product Completion and Sale

- ▶ Employees place completed candy bars in cartons and then move the cartons to the finished goods storeroom, where they are kept until they are shipped to customers. The cost of the completed candy bars increases the balance of the Finished Goods Inventory account and decreases the balance of the Work in Process Inventory account.
- ▶ When candy bars are sold, a clerk prepares a *sales invoice*, and another employee fills the order by removing the candy bars from the storeroom, packaging them, and shipping them to the customer. A *shipping document* shows the quantity of the products that are shipped and gives a description of them. The cost of the candy bars sold increases the Cost of Goods Sold account and decreases the balance of the Finished Goods Inventory account.

The Manufacturing Cost Flow

Manufacturing cost flow is the flow of manufacturing costs (direct materials, direct labor, and overhead) through the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts into the Cost of Goods Sold account. A defined, structured manufacturing cost flow is the foundation for product costing, inventory valuation, and financial reporting. It supplies all the information necessary to prepare the statement of cost of goods manufactured and compute the cost of goods sold, as shown in Exhibit 2-1.

Figure 2-4 summarizes the manufacturing cost flow as it relates to the inventory accounts and production activity of The Choice Candy Company for the year ended December 31. To show the basic flows in this example, we assume that all materials can be traced directly to the candy bars. This means that there are no indirect materials in the Materials Inventory account. We also work with the actual amount of overhead, rather than an estimated amount.

Materials Inventory Because there are no indirect materials in this case, the Materials Inventory account shows the balance of unused direct materials. The cost of direct materials purchased increases the balance of the Materials Inventory

account, and the cost of direct materials used by the Production Department decreases it.

Figure 2-4 shows the flows of material purchased and used through the Materials Inventory T account.

Study Note

When costs are transferred from one inventory account to another in a manufacturing company, they remain assets. They are on the balance sheet and are not expensed on the income statement until the finished goods are sold.

Work in Process Inventory The Work in Process Inventory account records the balance of partially completed units of the product.

- ▶ As direct materials and direct labor enter the production process, their costs are added to the Work in Process Inventory account. The cost of overhead for the current period is also added.
- ▶ The total costs of direct materials, direct labor, and overhead incurred and transferred to work in process inventory during an accounting period are called **total manufacturing costs** (also called *current manufacturing costs*). These costs increase the balance of the Work in Process Inventory account.
- ▶ The cost of all units completed and moved to finished goods inventory during an accounting period is the **cost of goods manufactured**. The cost of goods manufactured for the period decreases the balance of the Work in Process Inventory account.

Figure 2-4 recaps the inflows of direct materials, direct labor, and overhead into the Work in Process Inventory T account and the resulting outflow of completed product costs.

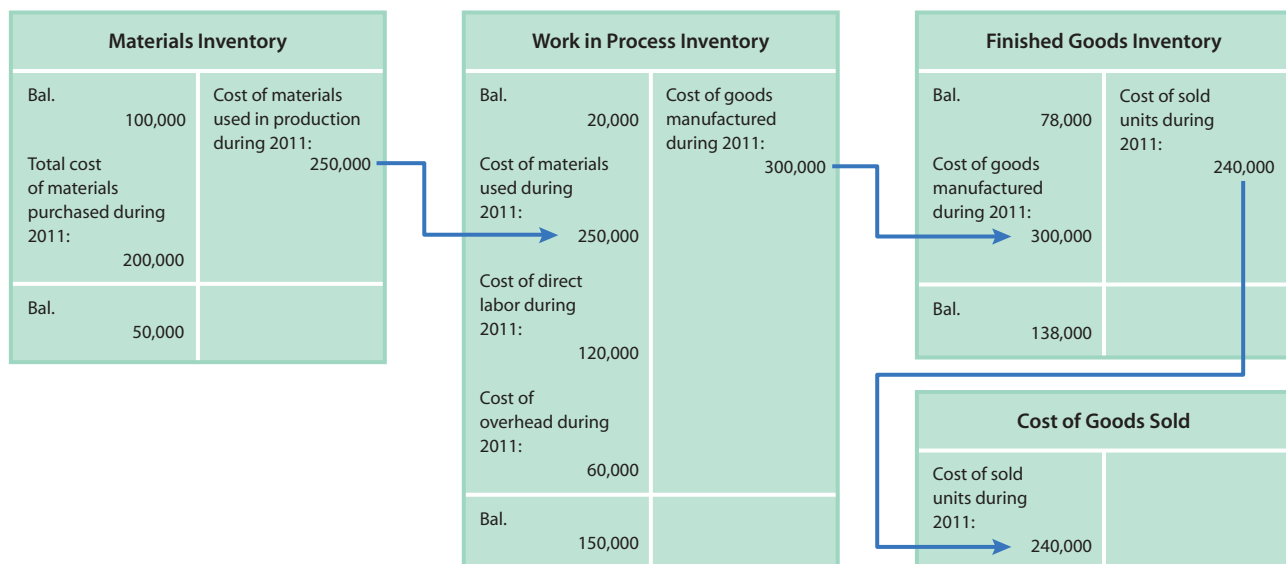
Study Note

Materials Inventory and Work in Process Inventory support the production process, while Finished Goods Inventory supports the sales and distribution functions.

Finished Goods Inventory The Finished Goods Inventory account holds the balance of costs assigned to all completed products that a manufacturing company has not yet sold. The cost of goods manufactured increases the balance, and the cost of goods sold decreases the balance.

Figure 2-4 shows the inflow of cost of goods manufactured and the outflow of cost of goods sold to the Finished Goods Inventory T account.

FIGURE 2-4 Manufacturing Cost Flow: An Example Using Actual Costing for The Choice Candy Company



STOP & APPLY >

Given the following information, use T accounts to compute the ending balances of the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts:

Materials Inventory, beginning balance	\$ 230
Work in Process Inventory, beginning balance	250
Finished Goods Inventory, beginning balance	380
Direct materials purchased	850
Direct materials (DM) placed into production (used)	740
Direct labor (DL) costs	970
Overhead (OH) costs	350
Cost of goods completed (COGM)	1,230
Cost of goods sold (COGS)	935

SOLUTION

MATERIAL INVENTORY				WORK IN PROCESS INVENTORY				FINISHED GOODS INVENTORY			
Beg.	230	Used	740	Beg.	250	COGM	1,230	Beg.	380	COGS	935
Purchased	850			DM	740			COGM	1,230		
End.	340			DL	970			End.	675		
				OH	350						
				End.	1,080						

Elements of Product Costs

LO4 Define *product unit cost*, and compute the unit cost of a product or service.

As noted above, product costs include all costs related to the manufacturing process. The three elements of product cost are direct materials costs, direct labor costs, and overhead costs.

- ▶ **Direct materials costs** are the costs of materials used in making a product that can be conveniently and economically traced to specific units of the product. Some examples of direct materials are the meat and bun in hamburgers, the oil and additives in a gallon of gasoline, and the sugar used in making candy. Direct materials may also include parts that a company purchases from another manufacturer, e.g., a battery and windshield for an automobile.
- ▶ **Direct labor costs** are the costs of the hands-on labor needed to make a product or service that can be traced to specific units. For example, the wages of production-line workers are direct labor costs.
- ▶ **Overhead costs** (also called *service overhead*, *factory overhead*, *factory burden*, *manufacturing overhead*, or *indirect production costs*) are production-related costs that cannot be practically or conveniently traced directly to an end product or service. They include **indirect materials costs**, such as the costs of nails, rivets, lubricants, and small tools, and **indirect labor costs**, such as the costs of labor for maintenance, inspection, engineering design, supervision, and materials handling. Other indirect manufacturing costs include the costs of building maintenance, property taxes, property insurance, depreciation on plant and equipment, rent, and utilities. As indirect costs, overhead costs are allocated to a product's cost using either traditional or activity-based costing methods, which we discuss later in the chapter.



FOCUS ON BUSINESS PRACTICE

Has Technology Shifted the Elements of Product Costs?

New technology and manufacturing processes have created new patterns of product costs. The three elements of product costs are still direct materials, direct labor, and overhead, but the percentage that each contributes to the total cost of a product has changed. From the 1950s through the 1970s, direct labor was the dominant element, making up over 40 percent of total product cost, while direct materials contributed 35 percent and

overhead, around 25 percent. Thus, direct costs, traceable to the product, accounted for 75 percent of total product cost. Improved production technology caused a dramatic shift in the three product cost elements. Machines replaced people, significantly reducing direct labor costs. Today, only 50 percent of the cost of a product is directly traceable to the product; the other 50 percent is overhead, an indirect cost.

To illustrate product costs and the manufacturing process, we'll refer again to The Choice Candy Company. Maggie Evans, the company's founder and president, has identified the following elements of the product cost of one candy bar:

- ▶ *Direct materials costs:* costs of sugar, chocolate, and wrapper
- ▶ *Direct labor costs:* costs of labor used in making the candy bar
- ▶ *Overhead costs:* indirect materials costs, including the costs of salt and flavorings; indirect labor costs, including the costs of labor to move materials to the production area and to inspect the candy bars during production; other indirect overhead costs, including depreciation on the building and equipment, utilities, property taxes, and insurance

Prime Costs and Conversion Costs

The three elements of manufacturing costs can be grouped into prime costs and conversion costs.

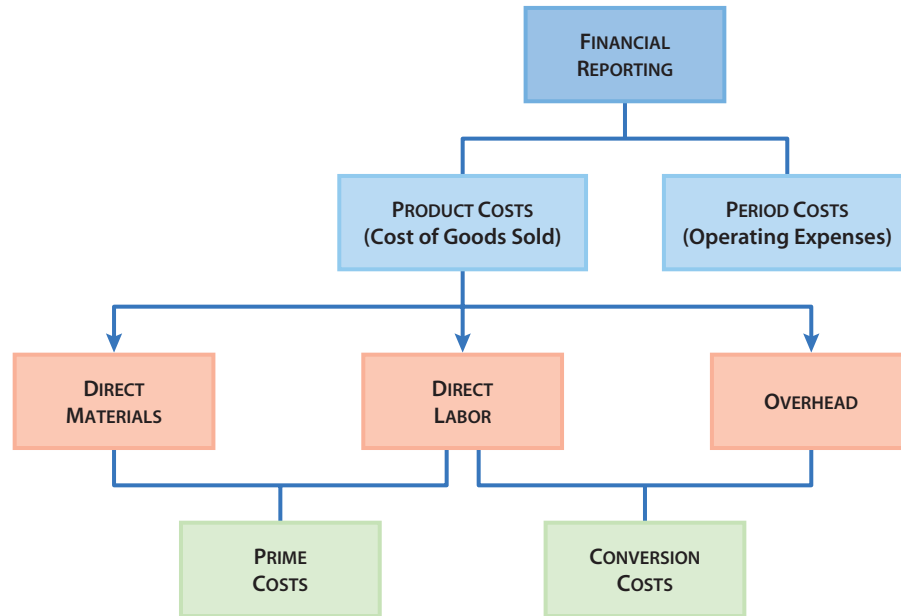
- ▶ **Prime costs** are the primary costs of production; they are the sum of the direct materials costs and direct labor costs.
- ▶ **Conversion costs** are the costs of converting direct materials into a finished product; they are the sum of direct labor costs and overhead costs.

These classifications are important for understanding the costing methods discussed in later chapters. Figure 2-5 summarizes the relationships among the product cost classifications presented so far.

Computing Product Unit Cost

Product unit cost is the cost of manufacturing a single unit of a product. It is made up of the costs of direct materials, direct labor, and overhead. These three cost elements are accumulated as a batch or production run of products is being produced. When the batch or run has been completed, the product unit cost is computed by dividing the total cost of direct materials, direct labor, and overhead

FIGURE 2-5
Relationships Among Product Cost
Classifications



by the total number of units produced, or by determining the cost per unit for each element of the product cost and summing those per unit costs.

$$\text{Product Unit Cost} = \frac{\text{Direct Materials Cost} + \text{Direct Labor Cost} + \text{Overhead Cost}}{\text{Number of Units Produced}}$$

or

$$\text{Product Unit Cost} = \text{Direct Materials Cost per Unit} + \text{Direct Labor Cost per Unit} + \text{Overhead Cost per Unit}$$

Product Cost Measurement Methods

How products flow physically and how costs are incurred do not always match. For example, The Choice Candy Company physically produces candy bars 24 hours a day, 7 days a week, but the accounting department only does accounting 8 hours a day, 5 days a week. Because product cost data must be available 24/7, managers may use estimates or predetermined standards to compute product costs during the period. At the end of the period, these estimates are reconciled with the actual product costs so actual product costs appear in the financial statements. Here are the three methods managers and accountants can use to calculate product unit cost:

- ▶ Actual costing method,
- ▶ Normal costing method, or
- ▶ Standard costing method.

Table 2-2 summarizes how these three product cost-measurement methods use actual and estimated costs.

Actual Costing Method The **actual costing** method uses the actual costs of direct materials, direct labor, and overhead when they become known to calculate the product unit cost. This means, many times, waiting until the end of the

TABLE 2-2
Use of Actual and Estimated Costs in
Three Cost-Measurement Methods

Product Cost Elements	Actual Costing	Normal Costing	Standard Costing
Direct materials	Actual costs	Actual costs	Estimated costs
Direct labor	Actual costs	Actual costs	Estimated costs
Overhead	Actual costs	Estimated costs	Estimated costs

Study Note

Many management decisions require estimates of future costs. Managers often use actual cost as a basis for estimating future cost.

period when all the cost data are available. For most companies, this is not practical. Notice in the following example that product unit cost is computed after the job was completed and all cost information was known.

The Choice Candy Company produced 3,000 candy bars on December 28 for Good Foods Store. Sara Kearney, the company's accountant, calculated that the actual costs for the order were direct materials, \$540; direct labor, \$420; and overhead, \$210. The actual product unit cost for the order was \$0.39, calculated as follows:

Actual direct materials (\$540 ÷ 3,000 candy bars)	\$0.18
Actual direct labor (\$420 ÷ 3,000 candy bars)	0.14
Actual overhead (\$210 ÷ 3,000 candy bars)	<u>0.07</u>
Actual product cost per candy bar (\$1,170 ÷ 3,000 candy bars)	<u>\$0.39</u>

Study Note

The use of normal costing is widespread, since many overhead bills, such as utility bills, are not received until after products or services are produced and sold.

Normal Costing Method The **normal costing** method combines the easy-to-track actual direct costs of materials and labor with estimated overhead costs to determine a product unit cost.

- ▶ The normal costing method is simple and allows a smoother, more even assignment of overhead costs to production during an accounting period than is possible with the actual costing method.
- ▶ However, at the end of the accounting period, any difference between the estimated and actual costs must be identified and removed so that the financial statements show only the actual product costs.

Assume that Sara Kearney used normal costing to price the Good Foods Store order for 3,000 candy bars and that overhead was applied to the product's cost using an estimated rate of 60 percent of direct labor costs. In this case, the costs for the order would include the actual direct materials cost of \$540, the actual direct labor cost of \$420, and an estimated overhead cost of \$252 (\$420 × 60%). The product unit cost would be \$0.40:

Actual direct materials (\$540 ÷ 3,000 candy bars)	\$0.18
Actual direct labor (\$420 ÷ 3,000 candy bars)	0.14
Estimated overhead (\$252 ÷ 3,000 candy bars)	<u>0.08</u>
Normal product cost per candy bar (\$1,212 ÷ 3,000 candy bars)	<u>\$0.40</u>

Standard Costing Method The **standard costing** method uses estimated or standard costs of direct materials, direct labor, and overhead to calculate the product unit cost.

- ▶ Managers sometimes need product cost information before the accounting period begins so that they can control the cost of operating activities or price

a proposed product for a customer. In such situations, product unit costs must be estimated, and the standard costing method can be helpful.

- ▶ Standard costing is very useful in performance management and evaluation because a manager can compare actual and standard costs to compute the variances. We cover standard costing in more detail in another chapter.

Assume that The Choice Candy Company is placing a bid to manufacture 2,000 candy bars for a new customer. From standard cost information developed at the beginning of the period, Kearney estimates the following costs: \$0.20 per unit for direct materials, \$0.15 per unit for direct labor, and \$0.09 per unit for overhead (assuming a standard overhead rate of 60 percent of direct labor cost). The standard cost per unit would be \$0.44:

Standard direct materials	\$0.20
Standard direct labor	0.15
Standard overhead ($\$0.15 \times 60\%$)	<u>0.09</u>
Standard product cost per candy bar	<u>\$0.44</u>

Computing Service Unit Cost

Delivering products, representing people in courts of law, selling insurance policies, and computing people's income taxes are typical of the services performed in many service organizations. Like other services, these are labor-intensive processes supported by indirect materials or supplies, indirect labor, and other overhead costs.

- ▶ The most important cost in a service organization is the direct cost of labor that can be traceable to the service rendered.
- ▶ The indirect costs incurred in performing a service are similar to those incurred in manufacturing a product. They are classified as overhead.
- ▶ These service costs appear on service organizations' income statements as cost of sales.

Study Note

Any material costs in a service organization would be for supplies used in providing services. Because these are indirect materials costs, they are included in overhead.

STOP & APPLY >

Fickle Picking Services provides inexpensive, high-quality labor for farmers growing vegetable and fruit crops. In September, Fickle Picking Services paid laborers \$4,000 to harvest 500 acres of apples. The company incurred overhead costs of \$2,400 for apple-picking services in September. This amount included the costs of transporting the laborers to the orchards; of providing facilities, food, and beverages for the laborers; and of scheduling, billing, and collecting from the farmers. Of this amount, 50 percent was related to picking apples. Compute the cost per acre to pick apples.

SOLUTION

Total cost to pick apples:	$\$4,000 + (0.50 \times \$2,400) = \$5,200$
Cost per acre to pick apples:	$\$5,200 \div 500 \text{ acres} = \10.40 per acre

Cost Allocation

LO5 Define *cost allocation*, and explain how the traditional method of allocating overhead costs figures into calculating product or service unit cost.

As noted earlier, the costs of direct materials and direct labor can be easily traced to a product or service, but overhead costs are indirect costs that must be collected and allocated in some manner.

- ▶ **Cost allocation** is the process of assigning a collection of indirect costs, such as overhead, to a specific **cost object**, such as a product or service, a department, or an operating activity, using an allocation base known as a cost driver.
- ▶ A **cost driver** might be direct labor hours, direct labor costs, units produced, or another activity base that has a cause-and-effect relationship with the cost.
- ▶ As the cost driver increases in volume, it causes the **cost pool**—the collection of indirect costs assigned to a cost object—to increase in amount.

Suppose The Choice Candy Company has a machine maintenance cost pool. The cost pool consists of overhead costs needed to maintain the machines, the cost object is the candy product, and the cost driver is machine hours. As more machine hours are used to maintain the machines, the amount of the cost pool increases, thus increasing the costs assigned to the candy product.

Allocating the Costs of Overhead

Allocating overhead costs to products or services is a four-step process that corresponds to the four stages of the management process:

1. *Planning.* In the first step, managers estimate overhead costs and calculate a rate at which they will assign those costs to products or services.
2. *Performing.* In the second step, this rate is applied to products or services as overhead costs are incurred and recorded during production.
3. *Evaluating.* In the third step, actual overhead costs are recorded as they are incurred, and managers calculate the difference between the estimated (or applied) and actual costs.
4. *Communicating.* In the fourth step, managers report on this difference.

Figure 2-6 summarizes these four steps in terms of their timing, the procedures involved, and the entries they require. It also shows how the cost flows in the various steps affect the accounting records.

Step 1. *Planning the overhead rate.* Before a period begins, managers determine cost pools and cost drivers and calculate a **predetermined overhead rate** by dividing the cost pool of total estimated overhead costs by the total estimated cost driver level.

- ▶ Grouping all estimated overhead costs into one cost pool and using direct labor hours or machine hours as the cost driver results in a single, plantwide overhead rate.
- ▶ This step requires no entry because no business activity has occurred.

Step 2. *Applying the overhead rate.* As units of the product or service are produced during the period, the estimated overhead costs are assigned to the product or service using the predetermined overhead rate.

- ▶ The predetermined overhead rate is multiplied by the actual cost driver level (e.g., the actual number of direct labor hours used to complete the product). The purpose of this calculation is to assign a consistent overhead cost to each unit produced during the period.
- ▶ An entry records the allocation of overhead. The entry to apply overhead to a product is recorded as a debit or increase to the Work in Process Inventory account and a credit or decrease to the Overhead account.

FIGURE 2-6
Allocating Overhead Costs: A Four-Step Process

	Step 1: Planning the Overhead Rate	Step 2: Applying the Overhead Rate	Step 3: Recording Actual Overhead Costs	Step 4: Reconciling Applied and Actual Overhead Costs																																												
Timing and Procedure	Before the accounting period begins, determine cost pools and cost drivers. Calculate the overhead rate by dividing the cost pool of total estimated overhead costs by the total estimated cost driver level.	During the accounting period, as units are produced, apply overhead costs to products by multiplying the predetermined overhead rate for each cost pool by the actual cost driver level for that pool. Record costs.	Record actual overhead costs as they are incurred during the accounting period.	At the end of the accounting period, calculate and reconcile the difference between applied and actual overhead costs.																																												
Entry	None	Increase Work in Process Inventory account and decrease Overhead account: Dr. Work in Process Inventory XX Cr. Overhead XX	Increase Overhead account and decrease asset accounts or increase contra-asset or liability accounts: Dr. Overhead XX Cr. Various Accounts XX	Entry will vary depending on how costs have been applied. If overapplied, increase Overhead and decrease Cost of Goods Sold. If underapplied, increase Cost of Goods Sold and decrease Overhead.																																												
Cost Flow Through the Accounts		<table border="1" style="margin: auto;"> <tr><td colspan="2" style="text-align: center;">Overhead</td></tr> <tr><td style="width: 50%;"></td><td style="width: 50%; text-align: center;">Overhead applied using predetermined rate</td></tr> <tr><td colspan="2" style="text-align: center;">Work in Process Inventory</td></tr> <tr><td style="width: 50%; text-align: center;">Overhead applied using predetermined rate</td><td style="width: 50%;"></td></tr> </table>	Overhead			Overhead applied using predetermined rate	Work in Process Inventory		Overhead applied using predetermined rate		<table border="1" style="margin: auto;"> <tr><td colspan="2" style="text-align: center;">Overhead</td></tr> <tr><td style="width: 50%; text-align: center;">Actual overhead costs recorded</td><td style="width: 50%;"></td></tr> <tr><td colspan="2" style="text-align: center;">Various Asset and Liability Accounts</td></tr> <tr><td style="width: 50%;"></td><td style="width: 50%; text-align: center;">Actual overhead costs recorded</td></tr> </table>	Overhead		Actual overhead costs recorded		Various Asset and Liability Accounts			Actual overhead costs recorded	<table border="1" style="margin: auto;"> <tr><td colspan="2" style="text-align: center;">Overapplied: Overhead</td></tr> <tr><td style="width: 50%;">Actual overhead costs recorded</td><td style="width: 50%; text-align: center;">Overhead applied using predetermined rate</td></tr> <tr><td colspan="2" style="text-align: center;">Overapplied</td></tr> <tr><td style="width: 50%;">Bal. \$0</td><td style="width: 50%;"></td></tr> <tr><td colspan="2" style="text-align: center;">Cost of Goods Sold</td></tr> <tr><td style="width: 50%;">Bal.</td><td style="width: 50%; text-align: center;">Overapplied</td></tr> <tr><td colspan="2" style="text-align: center;">Actual Bal.</td></tr> <tr><td colspan="2" style="text-align: center;">Underapplied: Overhead</td></tr> <tr><td style="width: 50%;">Actual overhead costs recorded</td><td style="width: 50%; text-align: center;">Overhead applied using predetermined rate</td></tr> <tr><td colspan="2" style="text-align: center;">Underapplied</td></tr> <tr><td style="width: 50%;">Bal. \$0</td><td style="width: 50%;"></td></tr> <tr><td colspan="2" style="text-align: center;">Cost of Goods Sold</td></tr> <tr><td style="width: 50%;">Bal. Underapplied</td><td style="width: 50%;"></td></tr> <tr><td colspan="2" style="text-align: center;">Actual Bal.</td></tr> </table>	Overapplied: Overhead		Actual overhead costs recorded	Overhead applied using predetermined rate	Overapplied		Bal. \$0		Cost of Goods Sold		Bal.	Overapplied	Actual Bal.		Underapplied: Overhead		Actual overhead costs recorded	Overhead applied using predetermined rate	Underapplied		Bal. \$0		Cost of Goods Sold		Bal. Underapplied		Actual Bal.	
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Step 3. Recording actual overhead costs. The actual overhead costs are recorded as they are incurred during the period.

- ▶ These costs include the actual costs of indirect materials, indirect labor, depreciation, property taxes, and other production costs.
- ▶ The entry made for the actual overhead costs records a debit in the Overhead account and a credit in the asset, contra-asset, or liability accounts affected.

Step 4. Reconciling the applied and actual overhead amounts. At the end of the period, the difference between the applied and actual overhead costs is calculated and reconciled.

Overapplied Overhead If the overhead costs applied to production during the period are greater than the actual overhead costs, the difference in the amounts represents **overapplied overhead costs**.

- ▶ If this difference is immaterial, the Overhead account is debited or increased and the Cost of Goods Sold or Cost of Sales account is credited or decreased by the difference.
- ▶ If the difference is material for the products produced, adjustments are made to the accounts affected—that is, the Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold accounts.

Underapplied Overhead If the overhead costs applied to production during the period are less than the actual overhead costs, the difference represents **underapplied overhead costs**.

- ▶ If the difference is immaterial, the Cost of Goods Sold or Cost of Sales account is debited or increased and the Overhead account is credited or decreased by this difference.
- ▶ If the difference is material for the products produced, adjustments are made to the accounts affected—that is, the Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold accounts.

Actual Cost of Goods Sold or Cost of Sales The adjustment for overapplied or underapplied overhead costs is necessary to reflect the actual overhead costs on the income statement.

Allocating Overhead: The Traditional Approach

The traditional approach to applying overhead costs to a product or service is to use a single plantwide overhead rate.

- ▶ This approach is especially useful when companies manufacture only one product or a few very similar products that require the same production processes and production-related activities, such as setup, inspection, and materials handling.
- ▶ The total overhead costs constitute one cost pool, and a traditional activity base—such as direct labor hours, direct labor costs, machine hours, or units of production—is the cost driver.

As we continue with our example of The Choice Candy Company, let's assume that the company will be selling two product lines in the coming year—plain candy bars and candy bars with nuts—and that Sara Kearney chooses direct labor hours as the cost driver. Kearney estimates that total overhead costs for the next year will be \$20,000 and that total direct labor hours (DLH) worked will be 400,000 hours.

Table 2-3 summarizes the first two steps in the traditional approach to allocating overhead costs.

Step 1. *Planning the overhead rate.* Kearney uses the following formula to compute the rate at which overhead costs will be applied:

$$\text{Predetermined Overhead Rate} = \frac{\$20,000}{400,000 \text{ DLH}} = \$0.05 \text{ per DLH}$$

Step 2. *Applying the overhead rate.* Kearney applies the predetermined overhead rate to the products. During the year, The Choice Candy Company actually uses 250,000 direct labor hours to produce 100,000 plain candy bars and 150,000 direct labor hours to produce 50,000 candy bars with nuts.

- ▶ The portion of the overhead cost applied to the plain candy bars totals \$12,500 ($\$0.05 \times 250,000 \text{ DLH}$), or \$0.13 per unit ($\$12,500 \div 100,000 \text{ units}$).
- ▶ The portion of overhead applied to the candy bars with nuts totals \$7,500 ($\$0.05 \times 150,000 \text{ DLH}$), or \$0.15 per unit ($\$7,500 \div 50,000 \text{ units}$).

Product Unit Cost Using the Normal Costing Approach Kearney also wants to calculate the product unit cost for the accounting period using normal costing. She gathers the following data for the two product lines:

TABLE 2-3 Allocating Overhead Costs and Calculating Product Unit Cost: Traditional Approach

Step 1. Calculate overhead rate for cost pool:

$$\frac{\text{Estimated Total Overhead Costs}}{\text{Estimated Total Cost Driver Level}} = \frac{\$20,000}{400,000 \text{ (DLH)}} = \$0.05 \text{ per DLH}$$

Step 2. Apply predetermined overhead rate to products:

	<u>Plain Candy Bars</u>	<u>Candy Bars with Nuts</u>
	Predetermined Overhead Rate × Actual Cost Driver Level = Cost Applied to Production	Predetermined Overhead Rate × Actual Cost Driver Level = Cost Applied to Production
Overhead applied: \$0.05 per DLH	$\$0.05 \times 250,000 \text{ DLH} = \underline{\underline{\$12,500}}$	$\$0.05 \times 150,000 \text{ DLH} = \underline{\underline{\$7,500}}$
Overhead cost per unit:		
Cost Applied ÷ Number of Units	$\$12,500 \div 100,000 = \underline{\underline{\$0.13^*}}$	$\$7,500 \div 50,000 = \underline{\underline{\$0.15}}$

Product unit cost using normal costing:

	<u>Plain Candy Bars</u>	<u>Candy Bars with Nuts</u>
Product costs per unit:		
Direct materials	\$0.18	\$0.21
Direct labor	0.14	0.16
Applied overhead	<u>0.13</u>	<u>0.15</u>
Total product unit cost	<u><u>\$0.45</u></u>	<u><u>\$0.52</u></u>

*Rounded.

	<i>Plain Candy Bars</i>	<i>Candy Bars with Nuts</i>
Actual direct materials cost per unit	\$0.18	\$0.21
Actual direct labor cost per unit	0.14	0.16
Prime cost per unit	<u>\$0.32</u>	<u>\$0.37</u>

At the bottom of Table 2-3 is Kearney’s calculation of the normal product unit cost for each product line consisting of its prime costs plus applied overhead. The product unit cost of the candy bar with nuts (\$0.52) is higher than the plain candy bar’s cost (\$0.45) because producing the candy bar with nuts required more expensive materials and more labor time.

Step 3. Recording actual overhead costs. Kearney records the actual overhead costs as they were incurred during the year. The actual overhead costs totaled \$19,800. The entry she made records a debit in the Overhead account and a credit in the asset, contra-asset, or liability accounts affected.

Step 4. Reconciling the applied and actual overhead amounts. Kearney compares the actual and applied overhead costs to compute the amount of underapplied or overapplied overhead:

	<i>Actual</i>	<i>Applied</i>	<i>Overapplied</i>
Overhead Costs	\$19,800	\$20,000	\$200

Study Note

Don’t make the mistake of thinking that because a cost is not traced directly to a product, it is not a product cost. All manufacturing costs, both direct and indirect, are product costs.

Actual Cost of Goods Sold Cost of Goods Sold will be reduced by the \$200 of overapplied overhead costs. The adjustment is necessary to reflect the actual overhead costs on the income statement.

Allocating Overhead: The ABC Approach

Activity-based costing (ABC) is a more accurate method of assigning overhead costs to products or services than the traditional approach. It categorizes all indirect costs by activity, traces the indirect costs to those activities, and assigns activity costs to products or services using a cost driver related to the cause of the cost.

- ▶ A company that uses ABC identifies production-related activities or tasks and the events and circumstances that cause, or drive, those activities, such as number of inspections or maintenance hours. As a result, many smaller activity pools are created from the single overhead cost pool used in the traditional method.
- ▶ This means that managers will calculate many rates. There will be an overhead rate, or activity cost rate, for each activity pool, which must be applied to products or services produced.
- ▶ Managers must select an appropriate number of activity pools instead of the traditional plantwide rate for overhead.

ABC will improve the accuracy of product or service cost estimates for organizations. More careful cost allocation means that managers will have better information for decision making.

STOP & APPLY >

1. Compute the predetermined overhead rate for the Sample Service Company if its estimated overhead costs for the coming year will be \$15,000 and 5,000 direct labor hours will be worked.
2. Calculate the amount of overhead costs applied by the Sample Service Company to one of its jobs if the job required 10 direct labor hours to complete.
3. Compute the total cost of the job if prime (direct material and direct labor) costs incurred by Sample Service Company to complete it were \$60. If the job contained 5 units of service, what is the unit cost?
4. Using the traditional overhead rate computed in Step 1, determine the total amount of overhead applied to operations during the year if Sample Service Company compiles a total of 4,900 labor hours worked.
5. If Sample Company's actual overhead costs for the year are \$14,800, compute the amount of under- or overapplied overhead for the year. Will the Cost of Goods Sold account be increased or decreased to correct the under- or overapplication of overhead?

SOLUTION

$$\begin{aligned}
 1. \text{ Predetermined Overhead Rate} &= \frac{\text{Estimated Overhead Costs}}{\text{Estimated Direct Labor Hours}} \\
 &= \frac{\$15,000}{5,000 \text{ DLH}} = \$3.00 \text{ per DLH}
 \end{aligned}$$

$$\begin{aligned}
 2. \text{ Overhead Costs Applied} &= \text{Predetermined Overhead Rate} \times \text{Actual Hours Worked} \\
 &= \$3 \text{ per DLH} \times 10 \text{ Actual Direct Labor Hours Worked} = \$30
 \end{aligned}$$

$$\begin{aligned}
 3. \text{ Total Cost} &= \text{Actual Direct Materials Cost} + \text{Actual Direct Labor Cost} + \\
 &\quad \text{Applied Overhead Cost} \\
 &= \$60 + \$30 = \$90
 \end{aligned}$$

$$\begin{aligned}
 \text{Unit Cost} &= \frac{\text{Total Cost of Job}}{\text{Units Produced}} \\
 &= \frac{\$90}{5 \text{ units}} = \$18 \text{ per unit}
 \end{aligned}$$

$$\begin{aligned}
 4. \text{ Overhead Costs Applied} &= \text{Predetermined Overhead Rate} \times \text{Actual Hours Worked} \\
 &\quad \text{During Year} \\
 &= \$3 \text{ per DLH} \times 4,900 \text{ Actual Direct Labor Hours Worked} \\
 &= \$14,700
 \end{aligned}$$

$$\begin{aligned}
 5. \text{ Overhead Costs Applied} &= \$14,700 \\
 \text{Actual Overhead Costs} &= \underline{14,800} \\
 \text{Underapplied Overhead} &= \underline{\underline{\$ 100}}, \text{ which will increase the Cost of Goods Sold account}
 \end{aligned}$$

A LOOK BACK AT ► THE HERSHEY COMPANY

In this chapter's Decision Point, we posed these questions:

- How do managers at Hershey's determine the cost of a candy bar?
- How do managers use cost information?

To determine the cost of a candy bar, managers at **The Hershey Company** must conduct complex analyses of many product costs, as well as costs that are unrelated to products. They analyze both the traceable costs of direct labor and materials and the indirect costs needed to support candy production. They also consider any other relevant selling, administrative, or general operating costs that relate to the candy bars.

Classifying and analyzing costs helps managers make decisions that will sustain Hershey's profitability. All costs must be analyzed in terms of their traceability and behavior and in terms of whether they add value and how they affect the financial statements. Because many costs cannot be directly traced to specific candy products, managers must use a method of allocation to assign them. Possibilities include the traditional allocation method and the activity-based costing method discussed in this chapter.



Review Problem

Calculating Cost of
Goods Manufactured:
Three Fundamental
Steps
LO2 LO4

Assume that one of The Hershey Company's factories produces 50-pound blocks of dark chocolate and that it needs to prepare a year-end balance sheet and income statement, as well as a statement of cost of goods manufactured. During the year, the factory purchased \$361,920 of direct materials. The factory's direct labor costs for the year were \$99,085 (10,430 hours at \$9.50 per hour); its indirect labor costs totaled \$126,750 (20,280 hours at \$6.25 per hour). Account balances for the year were as follows:

Account	Balance
Plant Supervision	\$ 42,500
Factory Insurance	8,100
Utilities, Factory	29,220
Depreciation—Factory Building	46,200
Depreciation—Factory Equipment	62,800
Factory Security	9,460
Factory Repair and Maintenance	14,980
Selling and Administrative Expenses	76,480
Materials Inventory, beginning	26,490
Work in Process Inventory, beginning	101,640
Finished Goods Inventory, beginning	148,290
Materials Inventory, ending	24,910
Work in Process Inventory, ending	100,400
Finished Goods Inventory, ending	141,100

Required

1. Compute the cost of materials used during the year.
2. Given the cost of materials used, compute the total manufacturing costs for the year.

3. Given the total manufacturing costs for the year, compute the cost of goods manufactured during the year.
4. If 13,397 units (1 unit = 50-pound block of dark chocolate) were manufactured during the year, what was the actual product unit cost? (Round your answer to two decimal places.)

Answers to Review Problem

1. Cost of materials used:

Materials inventory, beginning	\$ 26,490
Direct materials purchased	361,920
Cost of materials available for use	<u>\$388,410</u>
Less materials inventory, ending	<u>24,910</u>
Cost of materials used	<u><u>\$363,500</u></u>

2. Total manufacturing costs:

Cost of materials used	\$363,500
Direct labor costs	99,085
Overhead costs	
Indirect labor	\$126,750
Plant supervision	42,500
Factory insurance	8,100
Utilities, factory	29,220
Depreciation–factory building	46,200
Depreciation–factory equipment	62,800
Factory security	9,460
Factory repair and maintenance	<u>14,980</u>
Total overhead costs	<u>340,010</u>
Total manufacturing costs	<u><u>\$802,595</u></u>

3. Cost of goods manufactured:

Total manufacturing costs	\$802,595
Add work in process inventory, beginning	<u>101,640</u>
Total cost of work in process during the year	<u>\$904,235</u>
Less work in process inventory, ending	<u>100,400</u>
Cost of goods manufactured	<u><u>\$803,835</u></u>

4. Actual product unit cost:

$$\frac{\text{Cost of Goods Manufactured}}{\text{Number of Units Manufactured}} = \frac{\$803,835}{13,397 \text{ units}} = \$60.00^*$$

*Rounded.


 A red octagonal sign with the word "STOP" in white, followed by the text "& REVIEW >" in red.

LO1 Explain how managers classify costs and how they use these cost classifications.

Managers in manufacturing, retail, and service organizations use information about operating costs and product or service costs to prepare budgets, make pricing and other decisions, calculate variances between estimated and actual costs, and communicate results.

A single cost can be classified as a direct or an indirect cost, a variable or a fixed cost, a value-adding or a nonvalue-adding cost, and a product or a period cost. These cost classifications enable managers to control costs by tracing them to cost objects, to calculate the number of units that must be sold to obtain a certain level of profit, to identify the costs of activities that do and do not add value to a product or service, and to prepare financial statements for parties outside the organization.

LO2 Compare how service, retail, and manufacturing organizations report costs on their financial statements and how they account for inventories.

Because the operations of service, retail, and manufacturing organizations differ, their financial statements differ as well. A service organization maintains no inventory accounts on its balance sheet. The cost of sales on its income statement reflects the net cost of the services sold. A retail organization, which purchases products ready for resale, maintains only a Merchandise Inventory account, which is used to record and account for items in inventory. The cost of goods sold is simply the difference between the cost of goods available for sale and the ending merchandise inventory. A manufacturing organization, because it creates a product, maintains three inventory accounts: Materials Inventory, Work in Process Inventory, and Finished Goods Inventory. Manufacturing costs flow through all three inventory accounts. During the accounting period, the cost of completed products is transferred to the Finished Goods Inventory account, and the cost of units that have been manufactured and sold is transferred to the Cost of Goods Sold account.

LO3 Describe the flow of costs through a manufacturer's inventory accounts.

The flow of costs through the inventory accounts begins when costs for direct materials, direct labor, and overhead are incurred. Materials costs flow first into the Materials Inventory account, which is used to record the costs of materials when they are received and again when they are issued for use in a production process. All manufacturing-related costs—direct materials, direct labor, and overhead—are recorded in the Work in Process Inventory account as the production process begins. When products are completed, their costs are transferred from the Work in Process Inventory account to the Finished Goods Inventory account. Costs remain in the Finished Goods Inventory account until the products are sold, at which time they are transferred to the Cost of Goods Sold account.

LO4 Define product unit cost, and compute the unit cost of a product or service.

Direct materials costs are the costs of materials used in making a product that can be conveniently and economically traced to specific product units. Direct labor costs include all labor costs needed to make a product or service that can be traced to specific product units. All other production-related costs are classified and accounted for as overhead costs. Such costs cannot be easily traced to end products or services, so a cost allocation method is used to assign them to products or services.

When a batch of products has been completed, the product unit cost is computed by dividing the total cost of direct materials, direct labor, and overhead by the total number of units produced. The product unit cost can be calculated using the actual, normal, or standard costing method. Under actual costing, the actual costs of direct materials, direct labor, and overhead are used to compare the product unit cost. Under normal costing, the actual costs of direct materials and direct labor are combined with the estimated cost of overhead to determine the product unit cost. Under standard costing, the estimated costs of direct materials, direct labor, and overhead are used to calculate the product unit cost. The components of product cost may be classified as prime costs or conversion costs. Prime costs are the primary costs of production; they are the sum of direct materials costs and direct labor costs. Conversion costs are the costs of converting direct materials into finished products; they are the sum of direct labor costs and overhead costs.

Because no products are manufactured in the course of providing services, service organizations have no materials costs. They do, however, have both direct labor costs and overhead costs, which are similar to those in manufacturing organizations. To determine the cost of performing a service, professional labor and service-related overhead costs are included in the analysis.

L05 Define cost allocation, and explain how the traditional method of allocating overhead costs figures into calculating product or service unit cost.

Cost allocation is the process of assigning collected indirect costs to a specific cost object using an allocation base known as a cost driver. The allocation of overhead costs requires the pooling of overhead costs that are affected by a common activity and the selection of a cost driver whose activity level causes a change in the cost pool. A cost pool is the collection of overhead costs assigned to a cost object. A cost driver is an activity base that causes the cost pool to increase in amount as the cost driver increases.

Allocating overhead is a four-step process that involves planning a rate at which overhead costs will be assigned to products or services, assigning overhead costs at this predetermined rate to products or services during production, recording actual overhead costs as they are incurred, and reconciling the difference between the actual and applied overhead costs. The Cost of Goods Sold or Cost of Sales account is corrected for an amount of over- or underapplied overhead costs assigned to the products or services. In manufacturing companies, if the difference is material, adjustments are made to the Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold accounts.

The traditional method applies overhead costs to a product or service by estimating one predetermined overhead rate and multiplying that rate by the actual cost driver level. The product or service unit cost is computed either by dividing the total product or service cost (the sum of the total applied overhead cost and the actual costs of direct materials and direct labor) by the total number of units produced or by determining the cost per unit for each element of the product's or service's cost and summing those per unit costs.

When ABC is used, overhead costs are grouped into a number of cost pools related to specific activities. For each activity pool, cost drivers are identified, and cost driver levels are estimated. Each activity cost rate is calculated by dividing the estimated activity pool amount by the estimated cost driver level. Overhead, which is divided into the activity pools, is applied to the product or service by multiplying the various activity cost rates by their actual cost driver levels. The product or service unit cost is computed by dividing the total product or service cost (the sum of the total applied cost pools and the actual costs of direct materials and direct labor) by the total number of units produced.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Activity-based costing (ABC) 67 (LO5)	Finished Goods Inventory account 54 (LO3)	Predetermined overhead rate 62 (LO5)
Actual costing 60 (LO4)	Fixed cost 48 (LO1)	Prime costs 59 (LO4)
Conversion costs 59 (LO4)	Indirect costs 47 (LO1)	Product costs 48 (LO1)
Cost allocation 62 (LO5)	Indirect labor costs 58 (LO4)	Product unit cost 59 (LO4)
Cost driver 62 (LO5)	Indirect materials costs 58 (LO4)	Standard costing 61 (LO4)
Cost object 62 (LO5)	Manufacturing cost flow 56 (LO3)	Statement of cost of goods manufactured 51 (LO2)
Cost of goods manufactured 57 (LO3)	Materials Inventory account 54 (LO3)	Total manufacturing costs 57 (LO3)
Cost pool 62 (LO5)	Nonvalue-adding cost 48 (LO1)	Underapplied overhead costs 64 (LO5)
Direct costs 47 (LO1)	Normal costing 61 (LO4)	Value-adding cost 48 (LO1)
Direct labor costs 58 (LO4)	Overapplied overhead costs 64 (LO5)	Variable cost 48 (LO1)
Direct materials costs 58 (LO4)	Overhead costs 58 (LO4)	Work in Process Inventory account 54 (LO3)
	Period costs 49 (LO1)	

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge And Skills

Short Exercises

LO1 Cost Classifications

SE 1. Indicate whether each of the following is a direct cost (D), an indirect cost (ID), or neither (N) and a variable (V) or a fixed (F) cost. Also indicate whether each adds value (VA) or does not add value (NVA) to the product and whether each is a product cost (PD) or a period cost (PER).

1. Production supervisor's salary
2. Sales commission
3. Wages of a production-line worker

LO2 Income Statement for a Manufacturing Organization

SE 2. Using the following information from Char Company, prepare an income statement through operating income for the year:

Sales	\$900,000
Finished goods inventory, beginning	45,000
Cost of goods manufactured	585,000
Finished goods inventory, ending	60,000
Operating expenses	275,000

LO3 Cost Flow in a Manufacturing Organization

SE 3. Given the following information, compute the ending balances of the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts:

Materials Inventory, beginning balance	\$ 23,000
Work in Process Inventory, beginning balance	25,750
Finished Goods Inventory, beginning balance	38,000
Direct materials purchased	85,000
Direct materials placed into production	74,000
Direct labor costs	97,000
Overhead costs	35,000
Cost of goods manufactured	123,000
Cost of goods sold	93,375

LO3 Document Flows in a Manufacturing Organization

SE 4. Identify the document needed to support each of the following activities in a manufacturing organization:

1. Placing an order for direct materials with a supplier
2. Recording direct labor time at the beginning and end of each work shift
3. Receiving direct materials at the shipping dock
4. Recording the costs of a specific job requiring direct materials, direct labor, and overhead
5. Issuing direct materials into production
6. Billing the customer for a completed order
7. Fulfilling a request from the Production Scheduling Department for the purchase of direct materials

L04 Elements of Manufacturing Costs

E 5. Dalston Lui, the accountant at Brightlight, Inc., must group the costs of manufacturing candles. Indicate whether each of the following items should be classified as direct materials (DM), direct labor (DL), overhead (O), or none of these (N). Also indicate whether each is a prime cost (PC), a conversion cost (CC), or neither (N).

1. Depreciation of the cost of vats to hold melted wax
2. Cost of wax
3. Rent on the factory where candles are made
4. Cost of George's time to dip the wicks into the wax
5. Cost of coloring for candles
6. Cost of Ray's time to design candles for Halloween
7. Sam's commission to sell candles to Candles Plus

L04 Computation of Product Unit Cost

E 6. What is the product unit cost for Job 14, which consists of 300 units and has total manufacturing costs of direct materials, \$4,500; direct labor, \$7,500; and overhead, \$3,600? What are the prime costs and conversion costs per unit?

L05 Calculation of Underapplied or Overapplied Overhead

SE 7. At year end, records show that actual overhead costs incurred were \$25,870 and the amount of overhead costs applied to production was \$27,000. Identify the amount of under- or overapplied overhead, and indicate whether the Cost of Goods Sold account should be increased or decreased to reflect actual overhead costs.

L05 Computation of Overhead Rate

SE 8. Compute the overhead rate per service request for the Maintenance Department if estimated overhead costs are \$18,290 and the number of estimated service requests is 3,100.

L05 Allocation of Overhead to Production

SE 9. Calculate the amount of overhead costs applied to production if the predetermined overhead rate is \$4 per direct labor hour and 1,200 direct labor hours were worked.

Exercises**L01 The Management Process and Operating Costs**

E 1. Indicate whether each of the following activities takes place during the planning (PL), performing (PE), evaluating (E), or communicating (C) stage of the management process:

1. Changing regular price to clearance price
2. Reporting results to appropriate personnel
3. Preparing budgets of operating costs
4. Comparing estimated and actual costs to determine variances

L01 Cost Classifications

E 2. Indicate whether each of the following costs for a bicycle manufacturer is a product or a period cost, a variable or a fixed cost, a value-adding or a nonvalue-adding cost, and, if it is a product cost, a direct or an indirect cost of the bicycle:

Example	Cost Classification			
	Product or Period	Variable or Fixed	Value-Adding or Nonvalue-Adding	Direct or Indirect
Bicycle tire	Product	Variable	Value-adding	Direct

1. Depreciation on office computer
2. Labor to assemble bicycle
3. Labor to inspect bicycle
4. Internal auditor's salary
5. Lubricant for wheels

L02 Comparison of Income Statement Formats

E 3. Indicate whether each of these equations applies to a service organization (SER), a retail organization (RET), or a manufacturing organization (MANF):

1. $\text{Cost of Goods Sold} = \text{Beginning Merchandise Inventory} + \text{Net Cost of Purchases} - \text{Ending Merchandise Inventory}$
2. $\text{Cost of Sales} = \text{Net Cost of Services Sold}$
3. $\text{Cost of Goods Sold} = \text{Beginning Finished Goods Inventory} + \text{Cost of Goods Manufactured} - \text{Ending Finished Goods Inventory}$

L02 Statement of Cost of Goods Manufactured

E 4. During August, Radio Company's purchases of direct materials totaled \$139,000; direct labor for the month was 3,400 hours at \$8.75 per hour. Radio also incurred the following overhead costs: utilities, \$5,870; supervision, \$16,600; indirect materials, \$6,750; depreciation, \$6,200; insurance, \$1,830; and miscellaneous, \$1,100.

Beginning inventory accounts were as follows: Materials Inventory, \$48,600; Work in Process Inventory, \$54,250; and Finished Goods Inventory, \$38,500. Ending inventory accounts were as follows: Materials Inventory, \$50,100; Work in Process Inventory, \$48,400; and Finished Goods Inventory, \$37,450.

From the information given, prepare a statement of cost of goods manufactured.

L02 Statement of Cost of Goods Manufactured and Cost of Goods Sold

E 5. Treetop Corp. makes irrigation sprinkler systems for tree nurseries. Ramsey Roe, Treetop's new controller, can find only the following partial information for the past year:

	Oak Division	Loblolly Division	Maple Division	Spruce Division
Direct materials used	\$3	\$ 7	\$ g	\$ 8
Total manufacturing costs	6	d	h	14
Overhead	1	3	2	j
Direct labor	a	6	4	4
Ending work in process inventory	b	3	2	5
Cost of goods manufactured	7	20	12	1
Beginning work in process inventory	2	e	3	k
Ending finished goods inventory	2	6	i	9
Beginning finished goods inventory	3	f	5	7
Cost of goods sold	c	18	13	9

Using the information given, compute the unknown values. List the accounts in the proper order, and show subtotals and totals as appropriate.

L02 Characteristics of Organizations

E 6. Indicate whether each of the following is typical of a service organization (SER), a retail organization (RET), or a manufacturing organization (MANF):

1. Maintains only one balance sheet inventory account
2. Maintains no balance sheet inventory accounts
3. Maintains three balance sheet inventory accounts
4. Purchases products ready for resale
5. Designs and makes products for sale
6. Sells services
7. Determines the net cost of services sold
8. Includes the cost of goods manufactured in calculating cost of goods sold
9. Includes the net cost of purchases in calculating cost of goods sold

L02 Missing Amounts—Manufacturing

E 7. Presented below are incomplete inventory and income statement data for Toliver Corporation. Determine the missing amounts.

	Cost of Goods Sold	Cost of Goods Manufactured	Beginning Finished Goods Inventory	Ending Finished Goods Inventory
1.	\$ 10,000	\$12,000	\$ 1,000	?
2.	\$140,000	?	\$45,000	\$60,000
3.	?	\$89,000	\$23,000	\$20,000

L02 Inventories, Cost of Goods Sold, and Net Income

E 8. The data presented below are for a retail organization and a manufacturing organization.

1. Fill in the missing data for the retail organization:

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Sales	\$9	\$ e	\$15	\$ k
Gross margin	a	4	5	l
Ending merchandise inventory	5	f	5	m
Beginning merchandise inventory	4	g	h	5
Net cost of purchases	b	7	9	n
Operating income	3	2	i	2
Operating expenses	c	2	2	4
Cost of goods sold	5	6	j	11
Cost of goods available for sale	d	12	15	15

2. Fill in the missing data for the manufacturing organization:

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Ending finished goods inventory	\$a	\$ 3	\$ h	\$ 6
Cost of goods sold	6	3	5	l
Operating income	1	3	1	m
Cost of goods available for sale	8	d	10	13
Cost of goods manufactured	5	e	i	8
Gross margin	4	f	j	7
Operating expenses	3	g	5	6
Beginning finished goods inventory	b	2	3	n
Sales	c	10	k	14

L03 Documentation

E 9. Waltz Company manufactures music boxes. Seventy percent of its products are standard items produced in long production runs. The other 30 percent are special orders with specific requests for tunes. The latter cost from three to six times as much as the standard product because they require additional materials and labor.

Reza Seca, the controller, recently received a complaint memorandum from Iggy Paulo, the production supervisor, about the new network of source documents that has been added to the existing cost accounting system. The new documents include a purchase request, a purchase order, a receiving report, and a materials request. Paulo claims that the forms create extra work and interrupt the normal flow of production.

Prepare a written memorandum from Reza Seca to Iggy Paulo that fully explains the purpose of each type of document.

L03 Cost Flows and Inventory Accounts

E 10. For each of the following activities, identify the inventory account (Materials Inventory, Work in Process Inventory, or Finished Goods Inventory), if any, that is affected. If an inventory account is affected, indicate whether the account balance will increase or decrease. (*Example:* Moved completed units to finished goods inventory. *Answer:* Increase Finished Goods Inventory; decrease Work in Process Inventory.) If no inventory account is affected, use “None of these” as your answer.

1. Moved materials requested by production
2. Sold units of product
3. Purchased and received direct materials for production
4. Used direct labor and overhead in the production process
5. Received payment from customer
6. Purchased office supplies and paid cash
7. Paid monthly office rent

L04 Unit Cost Determination

E 11. The Pattia Winery is one of the finest wineries in the country. One of its famous products is a red wine called Old Vines. Recently, management has become concerned about the increasing cost of making Old Vines and needs to determine if the current selling price of \$10 per bottle is adequate. The winery wants to achieve a 25 percent gross profit on the sale of each bottle. The information on the next page is given to you for analysis.

1. Compute the unit cost per bottle for materials, labor, and overhead.
2. How would you advise management regarding the price per bottle of wine?
3. Compute the prime costs per unit and the conversion costs per unit.

Batch size	<u>10,550</u> bottles
Costs	
Direct materials	
Olen Millot grapes	\$22,155
Chancellor grapes	9,495
Bottles	<u>5,275</u>
Total direct materials costs	<u>\$36,925</u>
Direct labor	
Pickers/loaders	\$ 2,110
Crusher	422
Processors	8,440
Bottler	<u>13,293</u>
Total direct labor costs	<u>\$24,265</u>
Overhead	
Depreciation—equipment	\$ 2,743
Depreciation—building	5,275
Utilities	1,055
Indirect labor	6,330
Supervision	7,385
Supplies	9,917
Repairs	1,477
Miscellaneous	<u>633</u>
Total overhead costs	<u>\$34,815</u>
Total production costs	<u><u>\$96,005</u></u>

L04 Unit Costs in a Service Business

E 12. Walden Green provides custom farming services to owners of 5-acre wheat fields. In July, he earned \$2,400 by cutting, turning, and baling 3,000 bales. In the same month, he incurred the following costs: gas, \$150; tractor maintenance, \$115; and labor, \$600. His annual tractor depreciation is \$1,500. What was Green's cost per bale? What was his revenue per bale? Should he increase the amount he charges for his services?

L05 Computation of Overhead Rate

E 13. The overhead costs that Lucca Industries, Inc., used to compute its overhead rate for the past year are as follows:

Indirect materials and supplies	\$ 79,200
Repairs and maintenance	14,900
Outside service contracts	17,300
Indirect labor	79,100
Factory supervision	42,900
Depreciation—machinery	85,000
Factory insurance	8,200
Property taxes	6,500
Heat, light, and power	7,700
Miscellaneous overhead	<u>5,760</u>
Total overhead costs	<u><u>\$346,560</u></u>

The allocation base for the past year was 45,600 total machine hours. For the next year, all overhead costs except depreciation, property taxes, and miscellaneous overhead are expected to increase by 10 percent. Depreciation should increase by 12 percent, and property taxes and miscellaneous overhead are expected to increase by 20 percent. Plant capacity in terms of machine hours used will increase by 4,400 hours.

1. Compute the past year's overhead rate. (Carry your answer to three decimal places.)
2. Compute the overhead rate for next year. (Carry your answer to three decimal places.)

L05 Computation and Application of Overhead Rate

E 14. Compumatics specializes in the analysis and reporting of complex inventory costing projects. Materials costs are minimal, consisting entirely of operating supplies (DVDs, inventory sheets, and other recording tools). Labor is the highest single expense, totaling \$693,000 for 75,000 hours of work last year. Overhead costs for last year were \$916,000 and were applied to specific jobs on the basis of labor hours worked. This year the company anticipates a 25 percent increase in overhead costs. Labor costs will increase by \$130,000, and the number of hours worked is expected to increase by 20 percent.

1. Determine the total amount of overhead anticipated this year.
2. Compute the overhead rate for this year. (Round your answer to the nearest cent.)
3. During April of this year, 11,980 labor hours were worked. Calculate the overhead amount assigned to April production.

L05 Disposition of Overapplied Overhead

E 15. At the end of this year, Compumatics had compiled a total of 89,920 labor hours worked. The actual overhead incurred was \$1,143,400.

1. Using the overhead rate computed in **E 14**, determine the total amount of overhead applied to operations during the year.
2. Compute the amount of overapplied overhead for the year.
3. Will the Cost of Goods Sold account be increased or decreased to correct the overapplication of overhead?

L02 Problems

A Manufacturing Organization's Balance Sheet

P 1. The following information is from the trial balance of Mills Manufacturing Company:

	Debit	Credit
Cash	\$ 34,000	
Accounts Receivable	27,000	
Materials Inventory, ending	31,000	
Work in Process Inventory, ending	47,900	
Finished Goods Inventory, ending	54,800	
Production Supplies	5,700	
Small Tools	9,330	
Land	160,000	
Factory Building	575,000	
Accumulated Depreciation–Factory Building		\$ 199,000
Factory Equipment	310,000	
Accumulated Depreciation– Factory Equipment		137,000
Patents	33,500	
Accounts Payable		26,900
Insurance Premiums Payable		6,700
Income Taxes Payable		41,500
Mortgage Payable		343,000
Common Stock		200,000
Retained Earnings		334,130
	<u>\$1,288,230</u>	<u>\$1,288,230</u>

Required

- Manufacturing organizations use asset accounts that are not needed by retail organizations.
 - List the titles of the asset accounts that are specifically related to manufacturing organizations.
 - List the titles of the asset, liability, and equity accounts that you would see on the balance sheets of both manufacturing and retail organizations.
- Assuming that the following information reflects the results of operations for the year, calculate the (a) gross margin, (b) cost of goods sold, (c) cost of goods available for sale, and (d) cost of goods manufactured:

Operating income	\$138,130
Operating expenses	53,670
Sales	500,000
Finished goods inventory, beginning	50,900

- Manager insight** ▶ 3. Does Mills Manufacturing use the periodic or perpetual inventory system?

LO4 Computation of Unit Cost

P 2. Carola Industries, Inc., manufactures discs for several of the leading recording studios in the United States and Europe. Department 60 is responsible for the electronic circuitry within each disc. Department 61 applies the plastic-like surface to the discs and packages them for shipment. Carola recently produced 4,000 discs for the Milo Company. In fulfilling this order, the departments incurred the following costs:

	Department	
	60	61
Direct materials used	\$29,440	\$3,920
Direct labor	6,800	2,560
Overhead	7,360	4,800

Manager insight ▶

1. Compute the unit cost for each department.
2. Compute the total unit cost for the Milo Company order.
3. The selling price for this order was \$14 per unit. Was the selling price adequate? List the assumptions and/or computations upon which you based your answer. What suggestions would you make to Carola Industries' management about the pricing of future orders?
4. Compute the prime costs and conversion costs per unit for each department.

LO5 Allocation of Overhead

P3. Natural Cosmetics Company applies overhead costs on the basis of machine hours. The overhead rate is computed by analyzing data from the previous year to determine the percentage change in costs. Thus, this year's overhead rate will be based on the percentage change multiplied by last year's costs.

	Last Year
Machine hours	<u>57,360</u>
Overhead costs	
Indirect labor	\$ 23,530
Employee benefits	28,600
Manufacturing supervision	18,480
Utilities	14,490
Factory insurance	7,800
Janitorial services	12,100
Depreciation—factory and machinery	21,300
Miscellaneous overhead	<u>7,475</u>
Total overhead	<u>\$133,775</u>

This year the cost of utilities is expected to increase by 40 percent over the previous year; the cost of indirect labor, employee benefits, and miscellaneous overhead is expected to increase by 30 percent over the previous year; the cost of insurance and depreciation is expected to increase by 20 percent over the previous year; and the cost of supervision and janitorial services is expected to increase by 10 percent over the previous year. Machine hours are expected to total 68,832.

Required

1. Compute the projected costs and the overhead rate for this year, using the information about expected cost increases. (Carry your answer to three decimal places.)
2. Jobs completed during this year and the machine hours used were as follows:

Job No.	Machine Hours
2214	12,300
2215	14,200
2216	9,800
2217	13,600
2218	11,300
2219	8,100

Determine the amount of overhead to be applied to each job and to total production during this year. (Round answers to whole dollars.)

3. Actual overhead costs for this year were \$165,845. Was overhead underapplied or overapplied? By how much? Should the Cost of Goods Sold account be increased or decreased to reflect actual overhead costs?

L05 Allocation of Overhead

P 4. Byte Computer Company, a manufacturing organization, has just completed an order that Grater, Ltd., placed for 80 computers. Direct materials, purchased parts, and direct labor costs for the Grater order are as follows:

Cost of direct materials	\$36,750.00	Direct labor hours	220
Cost of purchased parts	\$21,300.00	Average direct labor pay rate	\$15.25

Overhead costs were applied at a single, plantwide overhead rate of 270 percent of direct labor dollars.

Required

Using the traditional costing method, compute the total cost of the Grater order.

Alternate Problems

L02 Statement of Cost of Goods Manufactured

P 5. Dillo Vineyards, a large winery in Texas, produces a full line of varietal wines. The company, whose fiscal year begins on November 1, has just completed a record-breaking year. Its inventory account balances on October 31 of this year were Materials Inventory, \$1,803,800; Work in Process Inventory, \$2,764,500; and Finished Goods Inventory, \$1,883,200. At the beginning of the year, the inventory account balances were Materials Inventory, \$2,156,200; Work in Process Inventory, \$3,371,000; and Finished Goods Inventory, \$1,596,400.

During the fiscal year, the company's purchases of direct materials totaled \$6,750,000. Direct labor hours totaled 142,500, and the average labor rate was \$8.20 per hour. The following overhead costs were incurred during the year: depreciation—plant and equipment, \$685,600; indirect labor, \$207,300; property tax, plant and equipment, \$94,200; plant maintenance, \$83,700; small tools, \$42,400; utilities, \$96,500; and employee benefits, \$76,100.

Required

Prepare a statement of cost of goods manufactured for the fiscal year ended October 31.

L04 Unit Costs in a Service Business

P 6. Municipal Hospital relies heavily on cost data to keep its pricing structures in line with those of its competitors. The hospital provides a wide range of services, including intensive care, intermediate care, and a neonatal nursery. Joo Young, the hospital's controller, is concerned about the profits generated by the 30-bed intensive care unit (ICU), so she is reviewing current billing procedures for that unit. The focus of her analysis is the hospital's billing per ICU patient day. This billing equals the per diem cost of intensive care plus a 40 percent markup to cover other operating costs and generate a profit. ICU patient costs include the following:

Doctors' care	2 hours per day @ \$360 per hour (actual)
Special nursing care	4 hours per day @ \$85 per hour (actual)
Regular nursing care	24 hours per day @ \$28 per hour (average)
Medications	\$237 per day (average)
Medical supplies	\$134 per day (average)
Room rental	\$350 per day (average)
Food and services	\$140 per day (average)

One other significant ICU cost is equipment, which is about \$185,000 per room. Young has determined that the cost per patient day for the equipment is \$179.

Wiley Dix, the hospital director, has asked Young to compare the current billing procedure with another that uses industry averages to determine the billing per patient day.

Required

1. Compute the cost per patient per day.
2. Compute the billing per patient day using the hospital's existing markup rate. (Round answers to whole dollars.)
3. Industry averages for markup rates are as follows:

Equipment	30%	Medications	50%
Doctors' care	50	Medical supplies	50
Special nursing care	40	Room rental	30
Regular nursing care	50	Food and services	25

Using these rates, compute the billing per patient day. (Round answers to the nearest whole dollars.)

4. Based on your findings in requirements 2 and 3, which billing procedure would you recommend? Why?

LO5 Allocation of Overhead

P7. Lund Products, Inc., uses a predetermined overhead rate in its production, assembly, and testing departments. One rate is used for the entire company; it is based on machine hours. The rate is determined by analyzing data from the previous year to determine the percentage change in costs. Thus this year's overhead rate will be based on the percentage change multiplied by last year's costs. Lise Jensen is about to compute the rate for this year using the following data:

	Last Year's Costs
Machine hours	<u>41,800</u>
Overhead costs	
Indirect materials	\$ 57,850
Indirect labor	25,440
Supervision	41,580
Utilities	11,280
Labor-related costs	9,020
Depreciation, factory	10,780
Depreciation, machinery	27,240
Property taxes	2,880
Insurance	1,920
Miscellaneous overhead	<u>4,840</u>
Total overhead	<u>\$192,830</u>

This year the cost of indirect materials is expected to increase by 30 percent over the previous year. The cost of indirect labor, utilities, machinery depreciation, property taxes, and insurance is expected to increase by 20 percent over the previous year. All other expenses are expected to increase by 10 percent over the previous year. Machine hours for this year are estimated at 45,980.

Required

1. Compute the projected costs and the overhead rate for this year using the information about expected cost increases. (Round your answer to three decimal places.)
2. During this year, Lund Products completed the following jobs using the machine hours shown:

Job No.	Machine Hours	Job No.	Machine Hours
H-142	7,840	H-201	10,680
H-164	5,260	H-218	12,310
H-175	8,100	H-304	2,460

Determine the amount of overhead applied to each job. What was the total overhead applied during this year? (Round answers to the nearest dollar.)

3. Actual overhead costs for this year were \$234,485. Was overhead underapplied or overapplied this year? By how much? Should the Cost of Goods Sold account be increased or decreased to reflect actual overhead costs?
4. At what point during this year was the overhead rate computed? When was it applied? Finally, when was underapplied or overapplied overhead determined and the Cost of Goods Sold account adjusted to reflect actual costs?

LO5 Allocation of Overhead

P 8. Fraser Products, Inc., which produces copy machines for wholesale distributors in the Pacific Northwest, has just completed packaging an order from Kent Company for 150 Model 14 machines. Direct materials, purchased parts, and direct labor costs for the Kent order are as follows:

Cost of direct materials	\$17,450.00
Cost of purchased parts	\$14,800.00
Direct labor hours	140
Average direct labor pay rate	\$16.50

Overhead costs were applied at a single, plantwide overhead rate of 240 percent of direct labor dollars.

Required

Using the traditional costing approach, compute the total cost of the Kent order.

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 Cost Classifications

C 1. Visit a local fast-food restaurant. Observe all aspects of the operation and take notes on the entire process. Describe the procedures used to take, process, and fill an order and deliver the food to the customer. Based on your observations, make a list of the costs incurred by the restaurant. Then create a table similar to Table 2-1, in which you classify the costs you have identified by their traceability (direct or indirect), cost behavior (variable or fixed), value attribute (value-adding or nonvalue-adding), and implications for financial reporting (product or period costs). Be prepared to discuss your findings in class.

LO2 Financial Performance Measures

C 2. Tarbox Manufacturing Company makes sheet metal products for heating and air conditioning installations. Its statements of cost of goods manufactured and income statements for the last two years are presented below and on the next page.

Tarbox Manufacturing Company		
Statements of Cost of Goods Manufactured		
For the Years Ended December 31		
	This Year	Last Year
Direct materials used		
Materials inventory, beginning	\$ 91,240	\$ 93,560
Direct materials purchased (net)	987,640	959,940
Cost of direct materials available for use	\$1,078,880	\$1,053,500
Less materials inventory, ending	95,020	91,240
Cost of direct materials used	\$ 983,860	\$ 962,260
Direct labor	571,410	579,720
Overhead		
Indirect labor	\$ 182,660	\$ 171,980
Power	34,990	32,550
Insurance	22,430	18,530
Supervision	125,330	120,050
Depreciation	75,730	72,720
Other overhead costs	41,740	36,280
Total overhead	482,880	452,110
Total manufacturing costs	\$2,038,150	\$1,994,090
Add work in process inventory, beginning	148,875	152,275
Total cost of work in process during the period	\$2,187,025	\$2,146,365
Less work in process inventory, ending	146,750	148,875
Cost of goods manufactured	\$2,040,275	\$1,997,490

Tarbox Manufacturing Company		
Income Statements		
For the Years Ended December 31		
	This Year	Last Year
Sales	\$2,942,960	\$3,096,220
Cost of goods sold		
Finished goods inventory, beginning	\$ 142,640	\$ 184,820
Cost of goods manufactured	<u>2,040,275</u>	<u>1,997,490</u>
Cost of goods available for sale	\$2,182,915	\$ 2,182,310
Less finished goods inventory, ending	<u>186,630</u>	<u>142,640</u>
Total cost of goods sold	<u>1,996,285</u>	<u>2,039,670</u>
Gross margin	\$ 946,675	\$1,056,550
Selling and administrative expenses		
Sales salaries and commission expense	\$ 394,840	\$ 329,480
Advertising expense	116,110	194,290
Other selling expenses	82,680	72,930
Administrative expenses	<u>242,600</u>	<u>195,530</u>
Total selling and administrative expenses	<u>836,230</u>	<u>792,230</u>
Income from operations	\$ 110,445	\$ 264,320
Other revenues and expenses		
Interest expense	<u>54,160</u>	<u>56,815</u>
Income before income taxes	\$ 56,285	\$ 207,505
Income taxes expense	<u>19,137</u>	<u>87,586</u>
Net income	<u>\$ 37,148</u>	<u>\$ 119,919</u>

For the past several years, the company's income has been declining. You have been asked to comment on why the ratios for Tarbox's profitability have deteriorated.

1. In preparing your comments, compute the following ratios for each year:
 - a. Ratios of cost of direct materials used to total manufacturing costs, direct labor to total manufacturing costs, and total overhead to total manufacturing costs. (Round to one decimal place.)
 - b. Ratios of sales salaries and commission expense, advertising expense, other selling expenses, administrative expenses, and total selling and administrative expenses to sales. (Round to one decimal place.)
 - c. Ratios of gross margin to sales and net income to sales. (Round to one decimal place.)
2. From your evaluation of the ratios computed in 1, state the probable causes of the decline in net income.
3. What other factors or ratios do you believe should be considered in determining the cause of the company's decreased income?

LO1 Management Decision about a Supporting Service Function

C 3. As the manager of grounds maintenance for Latchey, a large insurance company in Missouri, you are responsible for maintaining the grounds surrounding the company's three buildings, the six entrances to the property, and the recreational facilities, which include a golf course, a soccer field, jogging and bike paths, and tennis, basketball, and volleyball courts. Maintenance includes gardening (watering, planting, mowing, trimming, removing debris, and so on) and land improvements (e.g., repairing or replacing damaged or worn concrete and gravel areas).

Early in January, you receive a memo from the president of Latchey requesting information about the cost of operating your department for the last 12 months. She has received a bid from Xeriscape Landscapes, Inc., to perform the gardening activities you now perform. You are to prepare a cost report that will help her decide whether to keep gardening activities within the company or to outsource the work.

1. Before preparing your report, answer the following questions:
 - a. What kinds of information do you need about your department?
 - b. Why is this information relevant?
 - c. Where would you go to obtain this information (sources)?
 - d. When would you want to obtain this information?
2. Draft a report showing only headings and line items that best communicate the costs of your department. How would you change your report if the president asked you to reduce the costs of operating your department?
3. One of your department's cost accounts is the Maintenance Expense–Garden Equipment account.
 - a. Is this a direct or an indirect cost?
 - b. Is it a product or a period cost?
 - c. Is it a variable or a fixed cost?
 - d. Does the activity add value to Latchey's provision of insurance services?
 - e. Is it a budgeted or an actual cost in your report?

LO2 Management Information Needs

C 4. The H&W Pharmaceuticals Corporation manufactures most of its three pharmaceutical products in Indonesia. Inventory balances for March and April are as follows:

	March 31	April 30
Materials Inventory	\$258,400	\$228,100
Work in Process Inventory	138,800	127,200
Finished Goods Inventory	111,700	114,100

During April, purchases of direct materials, which include natural materials, basic organic compounds, catalysts, and suspension agents, totaled \$612,600. Direct labor costs were \$160,000, and actual overhead costs were \$303,500. Sales of the company's three products for April totaled \$2,188,400. General and administrative expenses were \$362,000.

1. Prepare a statement of cost of goods manufactured and an income statement through operating income for the month ended April 30.
2. Why is it that the total manufacturing costs do not equal the cost of goods manufactured?
3. What additional information would you need to determine the profitability of each of the three product lines?
4. Indicate whether each of the following is a product cost or a period cost:
 - a. Import duties for suspension agent materials
 - b. Shipping expenses to deliver manufactured products to the United States

- c. Rent for manufacturing facilities in Jakarta
- d. Salary of the American production-line manager working at the Indonesian manufacturing facilities
- e. Training costs for an Indonesian accountant

L04 Preventing Pollution and the Costs of Waste Disposal

C 5. Lake Weir Power Plant provides power to a metropolitan area of 4 million people. Sundeep Guliani, the plant’s controller, has just returned from a conference on the Environmental Protection Agency’s regulations concerning pollution prevention. She is meeting with Alton Guy, the president of the company, to discuss the impact of the EPA’s regulations on the plant.

“Alton, I’m really concerned. We haven’t been monitoring the disposal of the radioactive material we send to the Willis Disposal Plant. If Willis is disposing of our waste material improperly, we could be sued,” said Guliani. “We also haven’t been recording the costs of the waste as part of our product cost. Ignoring those costs will have a negative impact on our decision about the next rate hike.”

“Sundeep, don’t worry. I don’t think we need to concern ourselves with the waste we send to Willis. We pay the company to dispose of it. The company takes it off our hands, and it’s their responsibility to manage its disposal. As for the cost of waste disposal, I think we would have a hard time justifying a rate increase based on a requirement to record the full cost of waste as a cost of producing power. Let’s just forget about waste and its disposal as a component of our power cost. We can get our rate increase without mentioning waste disposal,” replied Guy.

What responsibility for monitoring the waste disposal practices at the Willis Disposal Plant does Lake Weir Power Plant have? Should Guliani take Guy’s advice to ignore waste disposal costs in calculating the cost of power? Be prepared to discuss your response.

L04 L05 Cookie Company (Continuing Case)

C 6. In the “Cookie Company” case in the last chapter, you prepared a mission statement for your company. You also set its strategic, tactical, and operating objectives; decided on its name; and identified the tools you might use to run it. Here, you will form a company team and assign roles to team members, set cookie specifications, decide on a cookie recipe, and answer some questions about product costs.

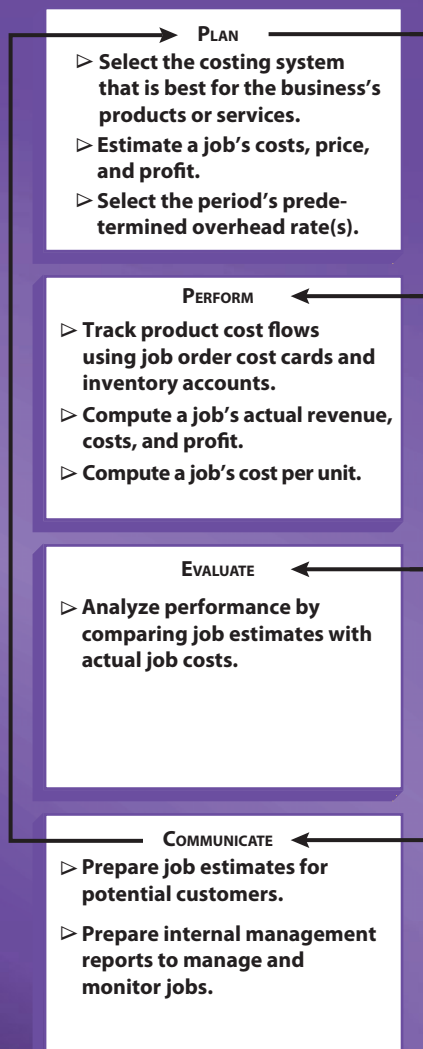
1. Join with 4 or 5 other students in the class to form a company team. (Your instructor may assign groups or allow students to organize their own teams.)
 - Determine team members’ tasks, and make team assignments (e.g., mixer, baker, quality controller, materials purchaser, accountant, marketing manager).
 - Assign each task an hourly pay rate or monthly salary based on your team’s perception of the job market for the task involved.
 - Give the plan compiled thus far to your instructor and all team members in writing.
2. As a team, determine cookie specifications: quality, size, appearance, and special features (such as types of chips or nuts), as well as quantity and packaging.
3. As a team, select a cookie recipe that best fits the company’s mission.
4. As a team, answer the following questions and submit the answers to your instructor:
 - Will your company use actual or normal costing when computing the cost per cookie? Explain your answer.
 - List the types of costs that your company will classify as overhead.

CHAPTER

3

Costing Systems: Job Order Costing

The Management Process



Companies that produce made-to-order products or services use a job order costing system to account for costs and determine unit cost.

A product costing system is expected to provide unit cost information, to supply cost data for management decisions, and to furnish ending values for the Materials, Work in Process, and Finished Goods Inventory accounts. Managers will select a job order costing system, a process costing system, or a hybrid of the two systems. In this chapter, we describe job order costing, including how to prepare job order cost cards and how to compute product unit cost. We also describe how job order costing differs from process costing. Process costing will be covered in the next chapter.

LEARNING OBJECTIVES

- LO1** Explain why unit cost is important in the management process. (pp. 92–93)
- LO2** Distinguish between the two basic types of product costing systems, and identify the information that each provides. (pp. 93–95)
- LO3** Explain the cost flow in a manufacturer's job order costing system. (pp. 95–101)
- LO4** Prepare a job order cost card, and compute a job order's product or service unit cost. (pp. 101–104)

DECISION POINT ▶ A MANAGER'S FOCUS COLD STONE CREAMERY, INC.

However you like your ice cream, **Cold Stone Creamery** can create it for you. The personalized process begins on a frozen granite counter-top with high-quality ice cream, which is freshly made every day, and your choice of mix-ins—chocolate, candy, nuts, fruit, and even homemade cake batter. Once the customer selects the mix-in, the server “spades” the ingredients together into a unique creation in one of three sizes—Like It, Love It, or Gotta Have It. To view many examples of this personalized process from around the world, search YouTube. Cold Stone has no immediate plans to create a mass-produced product for sale in grocery stores or other retail establishments. But, as you will see in this chapter, if it did create such a product, Cold Stone would need to adjust its product costing system, as well as performance measures.

- ▶ Is the product costing system that is used for custom-made items appropriate for mass-produced items?
- ▶ What performance measures would be most useful in evaluating the results of each type of product?



Product Unit Cost Information and the Management Process

LO1 Explain why unit cost is important in the management process.

Managers depend on relevant and reliable information about costs to manage their organizations. Although they vary in their approaches, managers share the same basic concerns as they move through the management process.

Planning

During the planning process, having knowledge of unit costs helps managers of both manufacturing and service companies set reasonable selling prices and estimate the cost of their products or services.

- ▶ **Products:** In manufacturing companies, such as **Cold Stone Creamery**, **Toyota**, and **Levi Strauss & Co.**, managers use unit cost information to develop budgets, establish product prices, and plan production volumes.
- ▶ **Services:** In service organizations, such as **Century 21**, **H&R Block**, and **UPS**, managers use cost information to develop budgets, establish prices, set sales goals, and determine human resource needs.

Performing

Managers make decisions every day about controlling costs, managing the company's activity volume, ensuring quality, and negotiating prices. They use timely cost and volume information and actual unit costs to support their decisions.

- ▶ In manufacturing companies, managers use information about costs to decide whether to drop a product line, add a production shift, outsource the manufacture of a subassembly to another company, bid on a special order, or negotiate a selling price.
- ▶ In service organizations, managers use cost information to make decisions about bidding on jobs, dropping a current service, outsourcing a task to an independent contractor, adding staff, or negotiating a price.

Evaluating

When managers evaluate results, they watch for changes in cost and quality. They compare actual and targeted total and unit costs, assess relevant price and volume information, and then adjust their planning and decision-making strategies.

- ▶ For example, if a service business's unit cost has risen, managers may break the unit cost down into its many components to analyze where costs can be cut or how the service can be performed more efficiently.

Communicating

Internal and external users analyze the data in the performance evaluation reports prepared by managers to determine whether the business is achieving cost goals for their organization's products or services.

- ▶ When managers report to stakeholders, they prepare financial statements.
- ▶ In manufacturing companies, managers use product unit costs to determine inventory balances for the organization's balance sheet and the cost of goods sold for its income statement.
- ▶ In service organizations, managers use unit costs of services to determine cost of sales for the income statement.
- ▶ When managers prepare internal performance evaluation reports, they compare actual unit costs with targeted costs, as well as actual and targeted nonfinancial measures of performance.

STOP & APPLY >

Shelley's Kennel provides pet boarding. Shelley, the owner of the kennel, must make several business decisions soon. Write *yes* or *no* to indicate whether knowing the cost to board one animal for one day (i.e., the product unit cost) can help Shelley answer these questions:

1. Is the daily boarding fee high enough to cover the kennel's costs?
2. How much profit will the kennel make if it boards an average of 10 dogs per day for 50 weeks?
3. What costs can be reduced to make the kennel's boarding fee competitive with that of its competitor?

SOLUTION

1. Yes; 2. Yes; 3. Yes

Product Costing Systems

LO2 Distinguish between the two basic types of product costing systems, and identify the information that each provides.

To meet managers' needs for cost information, it is necessary to have a highly reliable product costing system specifically designed to record and report the organization's operations.

A **product costing system** is a set of procedures used to account for an organization's product costs and to provide timely and accurate unit cost information for pricing, cost planning and control, inventory valuation, and financial statement preparation.

- ▶ The product costing system enables managers to track costs throughout the management process.
- ▶ It provides a structure for recording the revenue earned from sales and the costs incurred for direct materials, direct labor, and overhead.

Two basic types of product costing systems have been developed: job order costing systems and process costing systems. Table 3-1 summarizes the characteristics of both costing systems.

TABLE 3-1
Characteristics of Job Order Costing and Process Costing Systems

Job Order Costing System	Process Costing System
Traces manufacturing costs to a specific job order	Traces manufacturing costs to processes, departments, or work cells and then assigns the costs to products manufactured
Measures the cost of each completed unit	Measures costs in terms of units completed during a specific period
Uses a single Work in Process Inventory account to summarize the cost of all job orders	Uses several Work in Process Inventory accounts, one for each process, department, or work cell
Typically used by companies that make unique or special-order products, such as customized publications, built-in cabinets, or made-to-order draperies	Typically used by companies that make large amounts of similar products or liquid products or that have long, continuous production runs of identical products, such as makers of paint, soft drinks, candy, bricks, and paper

Businesses that make special-order items, such as the kitchen cabinets shown here, use a job order costing system. With such a system, the costs of direct materials (e.g., the wood used in framing the cabinets), direct labor, and overhead (e.g., insurance and depreciation on tools and vehicles) are traced to a specific batch of products or job order. All costs are recorded on a job order cost card.

Courtesy of George Peters/
istockphoto.com.



A **job order costing system** is used by companies that make unique or special-order products, such as personalized ice cream creations, specially built cabinets, made-to-order draperies, or custom-tailored suits.

- ▶ It uses a single Work in Process Inventory account to record the costs of all job orders.
- ▶ It traces the costs of direct materials, direct labor, and overhead to a specific batch of products or a specific **job order** (i.e., a customer order for a specific number of specially designed, made-to-order products) by using job order cost cards.
- ▶ A **job order cost card** is usually an electronic or paper document on which all costs incurred in the production of a particular job order are recorded. The costs that a job order costing system gathers are used to measure the cost of each completed unit.

Study Note

In job order costing, costs are traced to jobs; in process costing, costs are traced to production processes.

A **process costing system** is used by companies that produce large amounts of similar products or liquid products or that have long, continuous production runs of identical products. Makers of paint, soft drinks, candy, bricks, paper, and gallon containers of ice cream would use such a system.

- ▶ It first traces the costs of direct materials, direct labor, and overhead to processes, departments or work cells and then assigns the costs to the products manufactured by those processes, departments, or work cells during a specific period.
- ▶ It uses several Work in Process Inventory accounts, one for each process, department, or work cell.

In reality, few production processes are a perfect match for either a job order costing system or a process costing system. The typical product costing system therefore combines parts of job order costing and process costing to create a hybrid system known as an **operations costing system** designed specifically for an organization's production process.

- ▶ For example, an automobile maker like **Toyota** may use process costing to track the costs of manufacturing a standard car and job order costing to track the costs of customized features, such as a convertible top or a stick shift.



FOCUS ON BUSINESS PRACTICE

Why Does Toyota Use a Hybrid Product Costing System?

Thanks to its virtual production line, **Toyota** can now manufacture custom vehicles in five days. Computer software allows Toyota to calculate the exact number of parts needed at each precise point on its production line for a certain mix of cars. The mix can be modified up to five days in advance

of actual production, allowing Toyota to modify a production run to include custom orders. With its virtual production line and a hybrid product costing system, Toyota has an advantage over its competitors.

STOP & APPLY >

State whether a job order costing system or a process costing system would typically be used to account for the costs of the following:

1. Manufacturing golf tees
2. Manufacturing custom-designed fencing for a specific golf course
3. Providing pet grooming
4. Manufacturing golf balls
5. Manufacturing dog food
6. Providing private golf lessons

SOLUTION

1. Process; 2. Job; 3. Job; 4. Process; 5. Process; 6. Job

Job Order Costing in a Manufacturing Company

L03 Explain the cost flow in a manufacturer's job order costing system.

Study Note

In a job order costing system, the specific job or batch of product, *not* a department or work cell, is the focus of cost accumulation.

A job order costing system is a system that traces the costs of a specific order or batch of products to provide timely, accurate cost information and to facilitate the smooth and continuous flow of that information. A basic part of a job order costing system is the set of procedures, electronic documents, and accounts that a company uses when it incurs costs for direct materials, direct labor, and overhead. Job order cost cards and cost flows through the inventory accounts form the core of a job order costing system.

To study the cost flows in a job order costing system, let's look at how Jonas Lytton, the owner of Augusta Custom Golf Carts, Inc., operates his business. Augusta builds both customized and general-purpose golf carts.

- ▶ The direct materials costs for a golf cart include the costs of a cart frame, wheels, upholstered seats, a windshield, a motor, and a rechargeable battery.
- ▶ Direct labor costs include the wages of the two production workers who assemble the golf carts.
- ▶ Overhead includes indirect materials costs for upholstery zippers, cloth straps to hold equipment in place, wheel lubricants, screws and fasteners, and silicon to attach the windshield. It also includes indirect labor costs for moving materials to the production area and inspecting a golf cart during its

construction; depreciation on the manufacturing plant and equipment used to make the golf carts; and utilities, insurance, and property taxes related to the manufacturing plant.

Exhibit 3-1 shows the flow of each of these costs. Notice that the beginning balance in the Materials Inventory account means that there are already direct and indirect materials in the materials storeroom. The beginning balance in Work in Process Inventory means that Job CC is in production (with specifics given in the job order cost card). The zero beginning balance in Finished Goods Inventory means that all previously completed golf carts have been shipped.

Materials

When Augusta receives or expects to receive a sales order, the purchasing process begins with a request for specific quantities of direct and indirect materials that are needed for the order but are not currently available in the materials storeroom. When the new materials arrive at Augusta, the Accounting Department records the materials purchased by making an entry in journal form that debits or increases the balance of the Materials Inventory account and credits either the Cash or Accounts Payable account (depending on whether the purchase was for cash or credit):

	Dr.	Cr.
Materials Inventory	XX	
Cash or Accounts Payable		XX

During the month, Augusta made two purchases on credit. As shown in Exhibit 3-1, these purchases increase the debit balances in the Materials Inventory account and increase the credit balances in the Accounts Payable account.

- ▶ In transaction 1, the company purchased cart frames costing \$572 and wheels costing \$340 for a total of \$912 from one of its vendors.
- ▶ In transaction 2, the company purchased indirect materials costing \$82 from another vendor.

When golf carts are scheduled for production, requested materials are sent to the production area. To record the flow of direct materials requested from the Materials Inventory account into the Work in Process Inventory account, the entry in journal form is:

	Dr.	Cr.
Work in Process Inventory	XX	
Materials Inventory		XX

To record the flow of indirect materials requested from the Materials Inventory account into the Overhead account, the entry in journal form is:

	Dr.	Cr.
Overhead	XX	
Materials Inventory		XX

During the month, Augusta processes requests for direct and indirect materials. Notice that the direct materials requested appear as a debit in the Work in Process Inventory account, and as a credit in the Materials Inventory account.

Study Note

It is often helpful to understand the process of tracking production costs as they flow through the three inventory accounts and the entries that are triggered by the organization's source documents. The entries that track product cost flows are provided as background.

EXHIBIT 3-1 The Job Order Costing System—Augusta Custom Golf Carts, Inc.

MATERIALS INVENTORY			WORK IN PROCESS INVENTORY		
Beg. Bal.	1,230	(3) 1,880	Beg. Bal.	400	(9) 3,880
(1)	912	(3) 96	(3)	1,880	
(2)	82		(4)	1,640	
End. Bal.	248		(8)	1,394	
			End. Bal.	1,434	
PAYROLL PAYABLE			FINISHED GOODS INVENTORY		
		(4) 1,640	Beg. Bal.	—	(10) 1,940
		(5) 760	(9)	3,880	
		End. Bal. 2,400	End. Bal.	1,940	
OVERHEAD			COST OF GOODS SOLD		
(3)	96	(8) 1,394	(10)	1,940	(11) 3
(5)	760		End. Bal.	1,937	
(6)	295				
(7)	240		ACCOUNTS PAYABLE		
	1,391	1,394		(1) 912	
(11)	3			(2) 82	
End. Bal.	—			End. Bal. 994	
CASH			SALES		
		(6) 295		(10) 3,000	
		End. Bal. 295		End. Bal. 3,000	
ACCOUNTS RECEIVABLE					
(10)	3,000				
End. Bal.	3,000				
ACCUMULATED DEPRECIATION					
		(7) 240			
		End. Bal. 240			

Notice that the indirect materials requested appear as a debit to the Overhead account instead of to a Work in Process Inventory account.

Transaction 3 shows the request for \$1,880 of direct materials for the production of two jobs. These costs are also recorded on the corresponding job order cost cards.

- ▶ Job CC, a batch run of two general-purpose golf carts already in production, required \$1,038 of the additional direct materials.
- ▶ Job JB, a customized golf cart made to the specifications of an individual customer, Alex Special, required \$842 of the direct materials.

In addition, transaction 3 accounts for the \$96 of indirect materials requested for production as a \$96 debit to Overhead and a \$96 credit to Materials Inventory.

Labor

Every pay period, the payroll costs are recorded. In general, the payroll costs include salaries and wages for direct and indirect labor as well as for nonproduction-related employees. As noted earlier, Augusta's two production employees assemble the golf carts. Several other employees support production by moving materials and inspecting the products. The following entry in journal form records the payroll:

	Dr.	Cr.
Work in Process Inventory (direct labor costs)	XX	
Overhead (indirect labor costs)	XX	
Selling and Administrative Expenses (nonproduction-related salary and wage costs)	XX	
Payroll Payable		XX

Transactions **4** and **5** show the total production-related wages earned by employees during the period.

- ▶ Transaction **4** shows the total direct labor cost of \$1,640 (\$1,320 for Job CC and \$320 for Job JB) as a debit to the Work in Process Inventory account and a credit to Augusta's Payroll Payable account.
- ▶ Transaction **5** shows that the indirect labor cost of \$760 flows to the Overhead account instead of to a particular job. The corresponding credit is to Augusta's Payroll Payable account.

Overhead

Thus far, indirect materials and indirect labor have been the only costs debited to the Overhead account. Other actual indirect production costs, such as utilities, property taxes, insurance, and depreciation, are also charged to the Overhead account as they are incurred during the period. In general, the entry in journal form to incur actual overhead costs appears as:

	Dr.	Cr.
Overhead	XX	
Cash or Accounts Payable		XX
Accumulated Depreciation		XX

- ▶ Transaction **6** shows that other indirect costs amounting to \$295 were paid.
- ▶ Transaction **7** records the \$240 of production-related depreciation. The corresponding credit is to Augusta's Accumulated Depreciation account for \$240.

During the period, to recognize all product-related costs for a job, an overhead cost estimate is applied to a job using a predetermined rate. The entry in journal form to apply overhead using a predetermined rate is:

	Dr.	Cr.
Work in Process Inventory	XX	
Overhead		XX

Based on its budget and past experience, Augusta currently uses a predetermined overhead rate of 85 percent of direct labor costs.

In transaction 8, total overhead of \$1,394 is applied, with \$1,122 going to Job CC (85 percent of \$1,320) and \$272 going to Job JB (85 percent of \$320).

- ▶ The Work in Process Inventory account is debited for \$1,394 (85 percent of \$1,640; see transaction 4), and the Overhead account is credited for the applied overhead of \$1,394.

Completed Units

When a custom job or a batch of general-purpose golf carts is completed and ready for sale, the products are moved from the manufacturing area to the finished goods. To record the cost flow of completed products from the Work in Process Inventory account into the Finished Goods Inventory account, the entry in journal form is:

Finished Goods Inventory	Dr.	Cr.
	XX	
Work in Process Inventory		XX

As shown in transaction 9, when Job CC is completed, its cost of \$3,880 is transferred from the Work in Process Inventory account to the Finished Goods Inventory account by debiting Finished Goods Inventory for \$3,880 and crediting Work in Process Inventory for \$3,880. Its job order cost card is also completed and transferred to the finished goods file.

Sold Units

When a company uses a perpetual inventory system, as Augusta does, two accounting entries are made when products are sold. One is prompted by the sales invoice and records the quantity and selling price of the products sold. The other entry, prompted by the delivery of products to a customer, records the quantity and cost of the products shipped. These two entries follow.

Cash or Accounts Receivable (sales price \times units sold)	Dr.	Cr.
	XX	
Sales (sales price \times units sold)		XX

Cost of Goods Sold (unit cost \times units sold)	Dr.	Cr.
	XX	
Finished Goods Inventory (unit cost \times units sold)		XX

In transaction 10, the \$1,940 cost of the one general-purpose golf cart that was sold during the period is transferred from the Finished Goods Inventory account to the Cost of Goods Sold account.

- ▶ The Finished Goods Inventory account has an ending balance of \$1,940 for the one remaining unsold cart.
- ▶ The \$3,000 sales price of the golf cart sold on account is also recorded in Accounts Receivable.

Study Note

In this example, the company uses a perpetual inventory system. In a periodic inventory system, the cost of goods sold is calculated at the end of the period.

Study Note

Why do financial statements require the reconciliation of overhead costs? Financial statements report actual cost information; therefore, estimated overhead costs applied during the accounting period must be adjusted to reflect actual overhead costs.

Reconciliation of Overhead Costs

To prepare financial statements at the end of the accounting period, the Cost of Goods Sold account must reflect actual product costs, including actual overhead. Thus, the Overhead account must be reconciled every period.

- ▶ **Underapplied overhead:** As you learned in a previous chapter, if at the end of the accounting period the actual overhead debit balance exceeds the applied overhead credit balance, then the Overhead account is said to be underapplied and the debit balance must be closed to the Cost of Goods Sold account. Here is the entry in journal form:

	Dr.	Cr.
Cost of Goods Sold	XX	
Overhead		XX

- ▶ **Overapplied overhead:** If the actual overhead cost for the period is less than the estimated overhead that was applied during the period, then the Overhead account is overapplied and the credit balance must be closed to the Cost of Goods Sold account. Here is the entry in journal form:

	Dr.	Cr.
Overhead	XX	
Cost of Goods Sold		XX

- ▶ In transaction 11, since the actual overhead cost for the period (\$1,391) is less than the overhead that was applied during the period (\$1,394), the \$3 credit balance must be closed to the Cost of Goods Sold account. The overapplied amount will reduce Cost of Goods Sold and it will then reflect the actual overhead costs incurred. Thus, \$3 is deducted from the Cost of Goods Sold account, making the ending balance of that account \$1,937.

STOP**& APPLY >**

Partial operating data for Sample Company are presented below. Sample Company's management has set the predetermined overhead rate for the current year at 60 percent of direct labor costs.

Account/Transaction	October
Beginning Materials Inventory	\$ 4,000
Beginning Work in Process Inventory	6,000
Beginning Finished Goods Inventory	2,000
Direct materials used	16,000
Direct materials purchased	a
Direct labor costs	24,000
Overhead applied	b
Cost of units completed	c
Cost of Goods Sold	50,000
Ending Materials Inventory	3,000
Ending Work in Process Inventory	10,000
Ending Finished Goods Inventory	d

Using T accounts and the data provided, compute the unknown values. Show all your computations.

(continued)

SOLUTION

MATERIALS INVENTORY			
Beg. Bal.	4,000	Used	16,000
(a) Purchased	15,000		
End. Bal.	3,000		

WORK IN PROCESS INVENTORY			
Beg. Bal.	6,000	(c) Cost of units completed	50,400
Direct materials used	16,000		
Direct labor	24,000		
(b) Overhead applied	14,400*		
End. Bal.	10,000		

FINISHED GOODS INVENTORY			
Beg. Bal.	2,000	Cost of goods sold	50,000
(c) Cost of units completed	50,400		
(d) End. Bal.	2,400		

*\$24,000 × 60% = \$14,400

A Job Order Cost Card and the Computation of Unit Cost

LO4 Prepare a job order cost card, and compute a job order's product or service unit cost.

As is evident from the preceding discussion, job order cost cards play a key role in a job order costing system. Each job being worked on has a job order cost card. As costs are incurred, they are classified by job and recorded on the appropriate card.

A Manufacturer's Job Order Cost Card and the Computation of Unit Cost

As you can see in Figure 3-1, a manufacturer's job order cost card has space for direct materials, direct labor, and overhead costs. It also includes the job order number, product specifications, the name of the customer, the date of the order, the projected completion date, and a cost summary. As a job incurs direct materials and direct labor costs, its job order cost card is updated. Overhead is also posted to the job order cost card at the predetermined rate.

- ▶ Job order cost cards for incomplete jobs make up the Work in Process Inventory account. To ensure correctness, the ending balance in the Work in Process Inventory account is compared with the total of the costs shown on the job order cost cards.

A job order costing system simplifies the calculation of product unit costs. When a job is finished, the costs of direct materials, direct labor, and overhead that have been recorded on its job order cost card are totaled.

- ▶ The product unit cost is computed by dividing the total costs for the job by the number of good (i.e., salable) units produced. The product unit cost is entered on the job order cost card and will be used to value items in inventory. The job order cost card in Figure 3-1 shows the costs for completed Job CC. Two golf carts were produced at a total cost of \$3,880, so the product unit cost was \$1,940.

FIGURE 3-1Job Order Cost Card for a
Manufacturing Company

			Job Order: <u> cc </u>
JOB ORDER COST CARD			
Augusta Custom Golf Carts, Inc. Spring Hill, Florida			
Customer:	<u>Stock</u>	Batch:	<u> x </u> Custom: <u> </u>
Specifications:	<u>Two general-purpose golf carts</u>		
Date of Order:	<u>2/26/11</u>		
Date of Completion:	<u>3/6/11</u>		
Costs Charged to Job	Previous Months	Current Month	Cost Summary
Direct materials	\$165	\$1,038	\$1,203
Direct labor	127	1,320	1,447
Overhead <small>(85% of direct labor cost)</small>	108	1,122	1,230
Totals	\$400	\$3,480	\$3,880
Units completed			÷ <u> 2 </u>
Product unit cost			\$1,940

Job Order Costing in a Service Organization

Many service organizations use a job order costing system to compute the cost of rendering services. The most important cost for a service organization is labor, which is carefully accounted for through the use of time cards. The cost flow of services is similar to the cost flow of manufactured products. Job order cost cards are used to keep track of the costs incurred for each job. Job costs include labor, materials and supplies, and service overhead.

To cover these costs and earn a profit, many service organizations base jobs on **cost-plus contracts**. Such contracts require the customer to pay all costs incurred in performing the job plus a predetermined amount of profit, which is based on the amount of costs incurred. When the job is complete, the costs on the completed job order cost card become the cost of services. The cost of services is adjusted at the end of the accounting period for the difference between the applied service overhead costs and the actual service overhead costs.

To illustrate how a service organization uses a job order costing system, let's assume that a company called Dream Golf Retreats earns its revenue by designing and selling golf retreat packages to corporate clients. Figure 3-2 shows Dream Golf Retreats' job order cost card for the Work Corporation. Costs have been categorized into three separate activities: planning, golf activities, and non-golf activities.

- ▶ The service overhead cost for planning is 40 percent of planning labor costs, and the service overhead cost for golf activities is 50 percent of on-site labor costs.
- ▶ Total costs incurred for this job were \$5,400.

FIGURE 3-2 Job Order Cost Card for a Service Organization

JOB ORDER COST CARD			
Dream Golf Retreats			
Job Order: <u>2011-A7</u>			
Customer: <u>Work Corporation</u>	Batch: _____	Customer: <u>X</u>	
Specifications: <u>Golf retreat for 45 executives</u>			
Date of Order: <u>3/24/11</u>		Date of Completion: <u>4/8/11</u>	
Costs Charged to Job	Previous Months	Current Month	Total Cost
Planning			
Supplies	\$ 100	\$ —	\$ 100
Labor	850		850
Overhead (40% of planning labor costs)	340	—	340
Totals	<u>\$1,290</u>	<u>—</u>	<u>\$1,290</u>
Golf Activities			
Supplies	\$ 970	\$1,200	\$2,170
Labor	400	620	1,020
Overhead (50% of on-site labor costs)	200	310	510
Totals	<u>\$1,570</u>	<u>\$2,130</u>	<u>\$3,700</u>
Non-Golf Activities			
Cost of outsourcing	\$ 90	\$ 320	\$ 410
Totals	<u>\$ 90</u>	<u>\$ 320</u>	<u>\$ 410</u>
Cost Summary to Date		Total Cost	
Planning		\$1,290	
Golf Activities		3,700	
Non-Golf Activities		410	
Total		<u>\$5,400</u>	
Profit Margin (15% of total cost)		810	
Job Revenue		<u>\$6,210</u>	

Study Note

Job order cost cards for service businesses record costs by activities done for the job. The activity costs may include supplies, labor, and overhead.

- ▶ Dream Golf Retreats' cost-plus contract with Work Corporation has a 15 percent profit guarantee. Therefore, \$810 of profit margin is added to the total cost to arrive at the total contract revenue of \$6,210, which is the amount billed to the Work Corporation.



& APPLY >

Complete the following job order cost card for five custom-built cabinets:

Job Order 16			
Job Order Cost Card			
Unique Cupboards, LLP			
Sample City, Oregon			
Customer:	<u>Brian Tofer</u>	Batch: <u> </u>	Custom: <u>X</u>
Specifications:	<u>5 custom cabinets</u>		
Date of Order:	<u>5/4/2011</u>	Date of Completion:	<u>6/8/2011</u>
Costs Charged to Job	Previous Months	Current Month	Cost Summary
Direct materials	\$3,500	\$2,800	\$?
Direct labor	2,300	1,600	?
Overhead applied	<u>1,150</u>	<u>800</u>	<u>?</u>
Totals	<u>\$?</u>	<u>\$?</u>	<u>\$?</u>
Units completed			÷ ?
Product unit cost			<u>\$?</u>

SOLUTION

Job Order 16			
Job Order Cost Card			
Unique Cupboards, LLP			
Sample City, Oregon			
Customer:	<u>Brian Tofer</u>	Batch: <u> </u>	Custom: <u>X</u>
Specifications:	<u>5 custom cabinets</u>		
Date of Order:	<u>5/4/2011</u>	Date of Completion:	<u>6/8/2011</u>
Costs Charged to Job	Previous Months	Current Month	Cost Summary
Direct materials	\$3,500	\$2,800	\$ 6,300
Direct labor	2,300	1,600	3,900
Overhead applied	<u>1,150</u>	<u>800</u>	<u>1,950</u>
Totals	<u>\$6,950</u>	<u>\$5,200</u>	<u>\$12,150</u>
Units completed			÷ <u>5</u>
Product unit cost			<u>\$ 2,430</u>

A LOOK BACK AT ► COLD STONE CREAMERY, INC.



The Decision Point at the beginning of this chapter focused on **Cold Stone Creamery**, a company known for its custom ice cream and cake creations. It posed these questions:

- Is the product costing system that is used for custom-made items appropriate for mass-produced items?
- What performance measures would be most useful in evaluating the results of each type of product?

Whether a product costing system is appropriate depends on the nature of the production process. Because the production of custom-made items and the production of mass-produced items involve different processes, they generally require different costing systems.

- When a product is custom-made, it is possible to use a job order costing system, which collects the costs of each order.
- When a product is mass-produced, the costs of a specific unit cannot be collected because there is a continuous flow of similar products. In this case a process costing system is used, and costs are collected by process, department, or work cell.

Thus, if Cold Stone Creamery were to introduce mass-produced cakes or quarts of ice cream for sale in grocery stores or other retail establishments, it would have to adjust its costing system to determine the product cost of a unit. It would also have to use different performance measures. Its management can now measure the profitability of each personalized order by comparing the order's cost and price. But if a mass-produced product were introduced, management would measure performance by comparing the budgeted and actual costs for a process, department, or work cell.

Review Problem

Job Order Costing LO4

Suppose one of **Cold Stone Creamery's** stores has begun hosting parties at its location. It uses job order cost cards to keep track of the costs of each party. Job costs (direct materials and supplies, direct labor, and service overhead) are categorized under three activities: planning and design, party, and cleanup. The service overhead charge for planning and design is 30 percent of the party planner's labor costs, and the service overhead charge for the party is 50 percent of the cost of the cake created for the party.

The manager has tracked all costs of the Happy Birthday Billy job, and now that the work is finished, it is time to complete the job order cost card. It is a cost-plus contract with a 25 percent profit guarantee. The costs for the job are as follows:

Costs During June

Planning and design	
Supplies	\$12.00
Party planner labor	25.00
Party	
Cake creation	21.50
Direct labor	16.00
Cleanup	
Janitorial service cost	35.25

Required

1. Create the job order cost card for the Happy Birthday Billy job.

2. What amount will the manager bill for the job?
3. Using the format of the Work in Process Inventory account in Exhibit 3-1, reconstruct the beginning balance and costs for the current month.

Answers to Review Problem

1. Job order cost card for the Happy Birthday Billy job:

Job Order Cost Card			
Cold Stone Creamery, Inc.			
Customer:	<u>Happy Birthday Billy</u>	Batch: _____	Custom: <u>X</u>
Specifications:	<u>Birthday party</u>		
Date of Order:	<u>5/28/2011</u>	Date of Completion:	<u>6/5/2011</u>

Costs Charged to Job	Current Month	Total Cost
Planning and design		
Supplies	\$ 12.00	\$12.00
Party planner labor	25.00	25.00
Overhead (30% of planning labor costs)	7.50	7.50
Totals	<u>\$ 44.50</u>	<u>\$44.50</u>
Party		
Cake creation	\$ 21.50	\$21.50
Direct labor	16.00	16.00
Overhead (50% of cake creation cost)	10.75	10.75
Totals	<u>\$ 48.25</u>	<u>\$48.25</u>
Cleanup		
Janitorial service costs	\$ 35.25	\$35.25
Totals	<u>\$ 35.25</u>	<u>\$35.25</u>
Cost Summary to Date		
Planning and design	\$ 44.50	
Party	48.25	
Cleanup	35.25	
Total	<u>\$128.00</u>	
Profit margin (25% of total cost)	32.00	
Job revenue	<u>\$160.00</u>	

2. The manager will bill \$160.00 for this job.
3. Beginning balance and costs for the current month:

Work in Process Inventory			
Beg. Bal.	—	Completed	128.00
Planning and design			
Supplies	12.00		
Party planner labor	25.00		
Overhead	7.50		
Party			
Cake creation	21.50		
Direct labor	16.00		
Overhead	10.75		
Cleanup			
Janitorial service costs	35.25		
End. Bal.	<u>—</u>		



LO1 Explain why unit cost is important in the management process.

When managers plan, information about costs helps them develop budgets, establish prices, set sales goals, plan production volumes, estimate product or service unit costs, and determine human resource needs. Daily, managers use cost information to make decisions about controlling costs, managing the company's volume of activity, ensuring quality, and negotiating prices. When managers evaluate results, they analyze actual and targeted information to evaluate performance and make any necessary adjustments to their planning and decision-making strategies. When managers communicate with stakeholders, they use unit costs to determine inventory balances and the cost of goods or services sold for the financial statements. They also analyze internal reports that compare the organization's measures of actual and targeted performance to determine whether cost goals for products or services are being achieved.

LO2 Distinguish between the two basic types of product costing systems, and identify the information that each provides.

A job order costing system is a product costing system used by companies that make unique, custom, or special-order products. Such a system traces the costs of direct materials, direct labor, and overhead to a specific batch of products or to a specific job order. A job order costing system measures the cost of each complete unit and summarizes the cost of all jobs in a single Work in Process Inventory account that is supported by job order cost cards.

A process costing system is a product costing system used by companies that produce large amounts of similar products or liquid products or that have long, continuous production runs of identical products. Such a system first traces the costs of direct materials, direct labor, and overhead to processes, departments, or work cells and then assigns the costs to the products manufactured by those processes, departments, or work cells. A process costing system uses several Work in Process Inventory accounts, one for each department, process, or work cell.

LO3 Explain the cost flow in a manufacturer's job order costing system.

In a manufacturer's job order costing system, the costs of materials are first charged to the Materials Inventory account. The various actual overhead costs are debited to the Overhead account. As products are manufactured, the costs of direct materials and direct labor are debited to the Work in Process Inventory account and are recorded on each job's job order cost card. Overhead costs are applied and debited to the Work in Process Inventory account and credited to the Overhead account using a predetermined overhead rate. They, too, are recorded on the job order cost card. When products and jobs are completed, the costs assigned to them are transferred to the Finished Goods Inventory account. Then, when the products are sold and shipped, their costs are transferred to the Cost of Goods Sold account.

LO4 Prepare a job order cost card, and compute a job order's product or service unit cost.

All costs of direct materials, direct labor, and overhead for a particular job are accumulated on a job order cost card. When the job has been completed, those costs are totaled. The total is then divided by the number of good units produced to find the product unit cost for that order. The product unit cost is entered on the job order cost card and will be used to value items in inventory.

Many service organizations use a job order costing system to track the costs of labor, materials and supplies, and service overhead to specific customer jobs. Labor is an important cost for service organizations, but their materials costs are usually negligible. To cover their costs and earn a profit, service organizations often base jobs on cost-plus contracts, which require the customer to pay all costs incurred plus a predetermined amount of profit.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Cost-plus contracts 102 (LO4)

Job order 94 (LO2)

Job order cost card 94 (LO2)

Job order costing system 94 (LO2)

Operations costing system 94 (LO2)

Process costing system 94 (LO2)

Product costing system 93 (LO2)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Uses of Product Costing Information

SE 1. Silly Putter Miniature Golf provides 36 holes of miniature golf. Dan, the owner of the golf course, must make several business decisions soon. Write *yes* or *no* to indicate whether knowing the cost to play one golf game (i.e., the product unit cost) can help Dan answer these questions:

1. Is the fee for playing a golf game high enough to cover the related cost?
2. How much profit will Silly Putter make if it sells an average of 100 games per day for 50 weeks?
3. What costs can be reduced to make the fee competitive with that of its competitor?

L02 Companies That Use Job Order Costing

SE 2. Write *yes* or *no* to indicate whether each of the following companies would typically use a job order costing system:

1. Soft-drink producer
2. Jeans manufacturer
3. Submarine contractor
4. Office building contractor
5. Stuffed-toy maker

L02 Job Order Versus Process Costing Systems

SE 3. State whether a job order costing system or a process costing system would typically be used to account for the costs of the following:

1. Manufacturing bottles of water
2. Manufacturing custom-designed swimming pools
3. Providing babysitting
4. Manufacturing one-size-fits-all flip-flop shoes
5. Manufacturing canned food
6. Providing accounting services

L03 Transactions in a Manufacturer's Job Order Costing System

SE 4. For each of the following transactions, state which account(s) would be debited and credited in a job order costing system:

1. Purchased materials on account, \$12,890
2. Charged direct labor to production, \$3,790
3. Requested direct materials for production, \$6,800
4. Applied overhead to jobs in process, \$3,570

L03 Transactions in a Manufacturer's Job Order Costing System

SE 5. Enter the following transactions into T accounts:

1. Incurred \$34,000 of direct labor and \$18,000 of indirect labor
2. Applied overhead based on 12,680 labor hours @ \$6.50 per labor hour

L03 Accounts for Job Order Costing

SE 6. Identify the accounts in which each of the following transactions for Acorn Furniture, a custom manufacturer of oak tables and chairs, would be debited and credited:

1. Issued oak materials into production for Job ABC
2. Recorded direct labor time for the first week in February for Job ABC
3. Purchased indirect materials from a vendor on account
4. Received a production-related electricity bill
5. Applied overhead to Job ABC
6. Completed but did not yet sell Job ABC

LO4 Product Unit Cost

SE 7. Write *yes* or *no* to indicate whether each of the following costs is included in a product unit cost. Then explain your answers.

- | | |
|---------------------------|-------------------------------|
| 1. Direct materials costs | 4. Fixed administrative costs |
| 2. Fixed overhead costs | 5. Direct labor costs |
| 3. Variable selling costs | 6. Variable overhead costs |

LO4 Computation of Product Unit Cost

SE 8. Complete the following job order cost card for six custom-built computer systems:

Job Order 168

Job Order Cost Card
Keeper 3000
Apache City, North Dakota

Customer: Brian Patcher Batch: Custom: X
 Specifications: 6 Custom-Built
 Computer Systems
 Date of Order: 4/4/2011 Date of Completion: 6/8/2011

Costs Charged to Job	Previous Months	Current Month	Cost Summary
Direct materials	\$3,540	\$2,820	\$?
Direct labor	2,340	1,620	?
Overhead applied	<u>2,880</u>	<u>2,550</u>	<u>?</u>
Totals	<u>\$?</u>	<u>\$?</u>	<u>\$?</u>
Units completed			<u>÷ ?</u>
Product unit cost			<u><u>\$?</u></u>

LO4 Job Order Costing in a Service Organization

SE 9. For each of the following transactions, state which account(s) would be debited and credited in a job order costing system for a desert landscaping business:

1. Charged customer for landscape design
2. Purchased cactus plants and gravel on credit for one job
3. Paid three employees to prepare soil for gravel
4. Paid for rental equipment to move gravel to job site

LO4 Job Order Costing with Cost-Plus Contracts

SE 10. Complete the following job order cost card for an individual tax return:

Job Order 2011-A7

Job Order Cost Card
Doremus Tax Service
Puyallup, Washington

Customer: Arthur Farnsworth Batch: Custom: X
 Specifications: Annual Individual Tax Return
 Date of Order: 3/24/2011 Date of Completion: 4/8/2011

Costs Charged to Job	Previous Months	Current Month	Total Cost
Client interview			
Supplies	\$10	\$ —	\$?
Labor	50	60	?
Overhead (40% of interview labor costs)	20	24	?
Totals	<u>\$?</u>	<u>\$?</u>	<u>\$?</u>
Preparation of return			
Supplies	\$—	\$ 16	\$?
Computer time	—	12	?
Labor	—	240	?
Overhead (50% of preparation labor costs)	—	120	?
Totals	<u>\$—</u>	<u>\$?</u>	<u>\$?</u>
Delivery			
Postage	\$—	\$ 12	\$?
Totals	<u>\$—</u>	<u>\$?</u>	<u>\$?</u>

Cost Summary to Date	Total Cost
Client interview	\$?
Preparation of return	?
Delivery	?
Total	<u>\$?</u>
Profit margin (25% of total cost)	<u>?</u>
Job revenue	<u>\$?</u>

Exercises

LO2 Product Costing

E 1. Bell Printing Company specializes in wedding invitations. Bell needs information to budget next year's activities. Write *yes* or *no* to indicate whether each of the following costs is likely to be available in the company's product costing system:

1. Cost of paper and envelopes
2. Printing machine setup costs
3. Depreciation of printing machinery
4. Advertising costs
5. Repair costs for printing machinery
6. Costs to deliver stationery to customers
7. Office supplies costs
8. Costs to design a wedding invitation
9. Cost of ink
10. Sales commissions

L02 Costing Systems: Industry Linkage

E 2. Which of the following products would typically be accounted for using a job order costing system? Which would typically be accounted for using a process costing system? (a) Paint, (b) jelly beans, (c) jet aircraft, (d) bricks, (e) tailor-made suit, (f) liquid detergent, (g) helium gas canisters used to inflate balloons, and (h) aluminum compressed-gas cylinders with a special fiberglass wrap for a Mount Everest expedition.

L02 Costing Systems: Industry Linkage

E 3. Which of the following products would typically be accounted for using a job order costing system? Which would typically be accounted for using a process costing system? (a) Standard nails, (b) television sets, (c) printed wedding invitations, (d) a limited edition of lithographs, (e) flea collars for pets, (f) personal marathon training program, (g) breakfast cereal, and (h) an original evening gown.

L03 Job Order Cost Flow

E 4. The three product cost elements—direct materials, direct labor, and overhead—flow through a job order costing system in a structured, orderly fashion. Specific accounts are used to verify and record cost information. Write a paragraph describing the cost flow in a job order costing system.

L03 Work in Process Inventory: T Account Analysis

E 5. On June 30, New Haven Company's Work in Process Inventory account showed a beginning balance of \$29,400. The Materials Inventory account showed a beginning balance of \$240,000. Production activity for July was as follows: Direct materials costing \$238,820 were requested for production; total manufacturing payroll was \$140,690, of which \$52,490 was used to pay for indirect labor; indirect materials costing \$28,400 were purchased and used; and overhead was applied at a rate of 150 percent of direct labor costs.

1. Record New Haven's materials, labor, and overhead costs for July in T accounts.
2. Compute the ending balance in the Work in Process Inventory account. Assume a transfer of \$461,400 to the Finished Goods Inventory account during the period.

L03 T Account Analysis with Unknowns

E 6. Partial operating data for Merton Company are presented below. Management has set the predetermined overhead rate for the current year at 120 percent of direct labor costs.

Account/Transaction	June	July
Beginning Materials Inventory	a	e
Beginning Work in Process Inventory	\$ 89,605	f
Beginning Finished Goods Inventory	79,764	\$ 67,660
Direct materials requested	59,025	g
Materials purchased	57,100	60,216
Direct labor costs	48,760	54,540
Overhead applied	b	h
Cost of units completed	c	231,861
Cost of Goods Sold	166,805	i
Ending Materials Inventory	32,014	27,628
Ending Work in Process Inventory	d	j
Ending Finished Goods Inventory	67,660	30,515

Using T accounts and the data provided, compute the unknown values. Show all your computations.

L03 T Account Analysis with Unknowns

E 7. Partial operating data for Charing Cross Company are presented below. Charing Cross Company's management has set the predetermined overhead rate for the current year at 80 percent of direct labor costs.

Account/Transaction	December
Beginning Materials Inventory	\$ 42,000
Beginning Work in Process Inventory	66,000
Beginning Finished Goods Inventory	29,000
Direct materials used	168,000
Direct materials purchased	a
Direct labor costs	382,000
Overhead applied	b
Cost of units completed	c
Cost of Goods Sold	808,000
Ending Materials Inventory	38,000
Ending Work in Process Inventory	138,600
Ending Finished Goods Inventory	d

Using T accounts and the data provided, compute the unknown values. Show all your computations.

L04 Job Order Cost Card and Computation of Product Unit Cost

E 8. In January, the Cabinet Company worked on six job orders for specialty kitchen cabinets. It began Job A-62 for Zeke Cabinets, Inc., on January 10, 2011 and completed it on January 24, 2011. Partial data for Job A-62 are as follows:

	Costs	Machine Hours Used
Direct materials		
Cedar	\$7,900	
Pine	6,320	
Hardware	2,930	
Assembly supplies	988	
Direct labor		
Sawing	2,840	120
Shaping	2,200	220
Finishing	2,250	180
Assembly	2,890	50

The Cabinet Company produced a total of 34 cabinets for Job A-62. Its current predetermined overhead rate is \$21.60 per machine hour. From the information given, prepare a job order cost card and compute the job order's product unit cost. (Round to whole dollars.)

L04 Computation of Product Unit Cost

E 9. Using job order costing, determine the product unit cost based on the following costs incurred during March: liability insurance, manufacturing, \$2,500; rent, sales office, \$2,900; depreciation, manufacturing equipment, \$6,100; direct materials, \$32,650; indirect labor, manufacturing, \$3,480;

indirect materials, \$1,080; heat, light, and power, manufacturing, \$1,910; fire insurance, manufacturing, \$2,600; depreciation, sales equipment, \$4,250; rent, manufacturing, \$3,850; direct labor, \$18,420; manager's salary, manufacturing, \$3,100; president's salary, \$5,800; sales commissions, \$8,250; and advertising expenses, \$2,975. The Inspection Department reported that 48,800 good units were produced during March. Carry your answer to two decimal places.

L04 Computation of Product Unit Cost

E 10. Wild Things, Inc., manufactures custom-made stuffed animals. Last month the company produced 4,540 stuffed bears with stethoscopes for the local children's hospital to sell at a fund-raising event. Using job order costing, determine the product unit cost of a stuffed bear based on the following costs incurred during the month: manufacturing utilities, \$500; depreciation on manufacturing equipment, \$450; indirect materials, \$300; direct materials, \$1,300; indirect labor, \$800; direct labor, \$2,400; sales commissions, \$3,000; president's salary, \$4,000; insurance on manufacturing plant, \$600; advertising expense, \$500; rent on manufacturing plant, \$5,000; rent on sales office, \$4,000; and legal expense, \$250. Carry your answer to two decimal places.

L04 Computation of Product Unit Cost

E 11. Arch Corporation manufactures specialty lines of women's apparel. During February, the company worked on three special orders: A-25, A-27, and B-14. Cost and production data for each order are as follows:

	Job A-25	Job A-27	Job B-14
Direct materials			
Fabric Q	\$10,840	\$12,980	\$17,660
Fabric Z	11,400	12,200	13,440
Fabric YB	5,260	6,920	10,900
Direct labor			
Garment maker	8,900	10,400	16,200
Layout	6,450	7,425	9,210
Packaging	3,950	4,875	6,090
Overhead			
(120% of direct labor costs)	?	?	?
Number of units produced	700	775	1,482

1. Compute the total cost associated with each job. Show the subtotals for each cost category.
2. Compute the product unit cost for each job. (Round your computations to the nearest cent.)

L04 Job Order Costing in a Service Organization

E 12. A job order cost card for Hal's Computer Services appears at the top of the next page. Complete the missing information. The profit factor in the organization's cost-plus contract is 30 percent of total cost.

Job Order Cost Card
Hal's Computer Services

Customer:	James Lowe
Job Order No.:	8-324
Contract Type:	Cost-Plus
Type of Service:	Software Installation and Internet Interfacing
Date of Completion:	October 6, 2011

Costs Charged to Job	Total Cost
Software installation services	
Installation labor	\$300
Service overhead (? % of installation labor costs)	?
Total	\$450
Internet services	
Internet labor	\$200
Service overhead (20% of Internet labor costs)	40
Total	\$?

Cost Summary to Date	Total Cost
Software installation services	\$?
Internet services	?
Total	\$?
Profit margin (30% of total cost)	?
Contract revenue	\$?

LO4 Job Order Costing in a Service Organization

E 13. A job order cost card for Miniblinds by Jenny appears below. Complete the missing information. The profit factor in the company's cost-plus contract is 50 percent of total cost.

Job Order Cost Card
Miniblinds by Jenny

Customer:	Carmen Sawyer
Job Order No.:	8-482
Contract Type:	Cost-Plus
Type of Service:	Miniblind Installation and Design
Date of Completion:	June 12, 2011

Costs Charged to Job	Total Cost
Installation services	
Installation labor	\$445
Service overhead (80% of installation labor costs)	?
Total	\$?
Designer services	
Designer labor	\$200
Service overhead (? % of designer labor costs)	?
Total	\$400

Cost Summary to Date	Total Cost
Installation services	\$?
Designer services	?
Total	\$?
Profit margin (50% of total cost)	?
Contract revenue	\$?

LO4 Job Order Costing in a Service Organization

E 14. Personal Shoppers, Inc., relieves busy women executives of the stress of shopping for clothes by taking an inventory of a client's current wardrobe and shopping for her needs for the next season or a special event. The company charges clients \$30 per hour for the service plus the cost of the clothes purchased. It pays its employees various hourly wage rates.

During September, Personal Shoppers worked with three clients. It began Job 9-3, for Lucinda Mapley, on September 3, 2011 and completed the job on September 30, 2011. Using the partial data that follow, prepare the job order cost card. What amount of profit will Personal Shoppers make on this job?

Costs Charged to Job	Costs	Hours	Other
In-person consultation			
Supplies	\$ 30		
Labor (\$10 per hour)		4	
Overhead (10% of in-person labor costs)			
Shopping			
Purchases	\$560		
Labor (\$15 per hour)		8	
Overhead (25% of shopping labor costs)			
Telephone consultations			
Cell phone calls (\$1 per call)			6 calls
Labor (\$6 per hour)		2	
Overhead (50% of telephone labor costs)			

Problems**LO3 T Account Analysis with Unknowns**

P 1. Flagstaff Enterprises makes flagpoles. Dan Dalripple, the company's new controller, can find only the following partial information for the past two months:

Account/Transaction	May	June
Beginning Materials Inventory	\$ 36,240	\$ e
Beginning Work in Process Inventory	56,480	f
Beginning Finished Goods Inventory	44,260	g
Materials purchased	a	96,120
Direct materials requested	82,320	h
Direct labor costs	b	72,250
Overhead applied	53,200	i
Cost of units completed	c	221,400
Cost of Goods Sold	209,050	j
Ending Materials Inventory	38,910	41,950
Ending Work in Process Inventory	d	k
Ending Finished Goods Inventory	47,940	51,180

The current year's predetermined overhead rate is 80 percent of direct labor cost.

Required

Using the data provided and T accounts, compute the unknown values.

LO3 Job Order Costing: T Account Analysis

P 2. Par Carts, Inc., produces special-order golf carts, so Par Carts uses a job order costing system. Overhead is applied at the rate of 90 percent of direct labor cost. The following is a list of transactions for January, 2011:

- Jan. 1 Purchased direct materials on account, \$215,400.
 2 Purchased indirect materials on account, \$49,500.
 4 Requested direct materials costing \$193,200 (all used on Job X) and indirect materials costing \$38,100 for production.
 10 Paid the following overhead costs: utilities, \$4,400; manufacturing rent, \$3,800; and maintenance charges, \$3,900.
 15 Recorded the following gross wages and salaries for employees: direct labor, \$120,000 (all for Job X); indirect labor, \$60,620.
 15 Applied overhead to production.
 19 Purchased indirect materials costing \$27,550 and direct materials costing \$190,450 on account.
 21 Requested direct materials costing \$214,750 (Job X, \$178,170; Job Y, \$18,170; and Job Z, \$18,410) and indirect materials costing \$31,400 for production.
 31 Recorded the following gross wages and salaries for employees: direct labor, \$132,000 (Job X, \$118,500; Job Y, \$7,000; Job Z, \$6,500); indirect labor, \$62,240.
 31 Applied overhead to production.
 31 Completed and transferred Job X (375 carts) and Job Y (10 carts) to finished goods inventory; total cost was \$855,990.
 31 Shipped Job X to the customer; total production cost was \$824,520 and sales price was \$996,800.
 31 Recorded these overhead costs (adjusting entries): prepaid insurance expired, \$3,700; property taxes (payable at year end), \$3,400; and depreciation—machinery, \$15,500.

Required

- Record the entries for all transactions in January using T accounts for the following: Materials Inventory, Work in Process Inventory, Finished Goods Inventory, Overhead, Cash, Accounts Receivable, Prepaid Insurance, Accumulated Depreciation—Machinery, Accounts Payable, Payroll Payable, Property Taxes Payable, Sales, and Cost of Goods Sold. Use job order cost cards for Job X, Job Y, and Job Z. Determine the partial account balances. Assume no beginning inventory balances. Also assume that when the payroll was recorded, entries were made to the Payroll Payable account.
- Compute the amount of underapplied or overapplied overhead as of January 31, 2011 and transfer it to the Cost of Goods Sold account.
- Why should the Overhead account's underapplied or overapplied overhead be transferred to the Cost of Goods Sold account?

L03 L04 Job Order Cost Flow

P 3. On May 31, the inventory balances of Princess Designs, a manufacturer of high-quality children's clothing, were as follows: Materials Inventory, \$21,360; Work in Process Inventory, \$15,112; and Finished Goods Inventory, \$17,120. Job order cost cards for jobs in process as of June 30 had these totals:

Job No.	Direct Materials	Direct Labor	Overhead
24-A	\$1,596	\$1,290	\$1,677
24-B	1,492	1,380	1,794
24-C	1,984	1,760	2,288
24-D	1,608	1,540	2,002

The predetermined overhead rate is 130 percent of direct labor costs. Materials purchased and received in June were as follows:

June 4	\$33,120
June 16	28,600
June 22	31,920

Direct labor costs for June were as follows:

June 15 payroll	\$23,680
June 29 payroll	25,960

Direct materials requested by production during June were as follows:

June 6	\$37,240
June 23	38,960

On June 30, Princess Designs sold on account finished goods with a 75 percent markup over cost for \$320,000.

Required

- Using T accounts for Materials Inventory, Work in Process Inventory, Finished Goods Inventory, Overhead, Accounts Receivable, Payroll Payable, Sales, and Cost of Goods Sold, reconstruct the transactions in June.
- Compute the cost of units completed during the month.
- What was the total cost of goods sold during June?
- Determine the ending inventory balances.
- Jobs 24-A and 24-C were completed during the first week of July. No additional materials costs were incurred, but Job 24-A required \$960 more of direct labor, and Job 24-C needed an additional \$1,610 of direct labor. Job 24-A was composed of 1,200 pairs of trousers; Job 24-C, of 950 shirts. Compute the product unit cost for each job. (Round your answers to two decimal places.)

LO4 Job Order Costing in a Service Organization

P 4. Riley & Associates is a CPA firm located in Clinton, Kansas. The firm deals primarily in tax and audit work. For billing of major audit engagements, it uses cost-plus contracts, and its profit factor is 25 percent of total job cost. Costs are accumulated for three primary activities: preliminary analysis, fieldwork, and report development. Current service overhead rates based on billable hours are preliminary analysis, \$12 per hour; fieldwork, \$20 per hour; and report development, \$16 per hour. Supplies are treated as direct materials and are traceable to each engagement. Audits for three clients—Fulcrum, Inc., Rainy Day Bakeries, and Our Place Restaurants—are currently in process. During March, 2011 costs related to these projects were as follows:

	Fulcrum, Inc.	Rainy Day Bakeries	Our Place Restaurants
Beginning Balances			
Preliminary analysis	\$1,160	\$2,670	\$2,150
Fieldwork	710	1,980	3,460
Report development	—	1,020	420
Costs During March			
Preliminary analysis			
Supplies	\$ 710	\$ 430	\$ 200
Labor: hours	60	10	12
dollars	\$1,200	\$ 200	\$ 240

Fieldwork			
Supplies	\$ 450	\$1,120	\$ 890
Labor: hours	120	240	230
dollars	\$4,800	\$9,600	\$9,200
Report development			
Supplies	\$ 150	\$ 430	\$ 390
Labor: hours	30	160	140
dollars	\$ 900	\$4,800	\$4,200

Required

- Using the format shown in this chapter's Review Problem, create the job order cost card for each of the three audit engagements.
- Riley & Associates will complete the audits of Rainy Day Bakeries and Our Place Restaurants by the end of March. What will the billing amount for each of those audit engagements be?
- What is the March ending balance of Riley & Associates' Audit in Process account?

L04 Job Order Costing in a Service Organization

P 5. Peruga Engineering Company specializes in designing automated characters and displays for theme parks. It uses cost-plus profit contracts, and its profit factor is 30 percent of total cost.

Peruga uses a job order costing system to track the costs of developing each job. Costs are accumulated for three primary activities: bid and proposal, design, and prototype development. Current service overhead rates based on engineering hours are as follows: bid and proposal, \$18 per hour; design, \$22 per hour; and prototype development, \$20 per hour. Supplies are treated as direct materials, traceable to each job. Peruga worked on three jobs, P-12, P-15, and P-19, during January, 2011. The following table shows the costs for those jobs:

	P-12	P-15	P-19
Beginning Balances			
Bid and proposal	\$2,460	\$2,290	\$ 940
Design	1,910	460	—
Prototype development	2,410	1,680	—
Costs During January			
Bid and proposal			
Supplies	\$ —	\$ 280	\$2,300
Labor: hours	12	20	68
dollars	\$ 192	\$ 320	\$1,088
Design			
Supplies	\$ 400	\$ 460	\$ 290
Labor: hours	64	42	26
dollars	\$1,280	\$ 840	\$ 520
Prototype development			
Supplies	\$6,744	\$7,216	\$2,400
Labor: hours	120	130	25
dollars	\$2,880	\$3,120	\$ 600

Required

1. Using the format in the answer to requirement **I** of this chapter's Review Problem, create the job order cost card for each of the three jobs.
 2. Peruga completed Jobs P-12 and P-15, and the customers approved the prototype products. Customer A plans to produce 12 special characters using the design and specifications created by Job P-12. Customer B plans to make 18 displays from the design developed by Job P-15. What dollar amount will each customer use as the cost of design for each of those products (i.e., what is the product unit cost for Jobs P-12 and P-15)? (Round to the nearest dollar.)
 3. What is the January ending balance of Peruga's Contract in Process account for the three jobs?
 4. Rank the jobs in order from most costly to least costly based on each job's total cost. From the rankings of cost, what observations can you make?
 5. Speculate on the price that Peruga should charge for such jobs.
- Manager insight** ▶
- Manager insight** ▶

Alternate Problems**L03 T Account Analysis with Unknowns**

P 6. Hard Core Enterprises makes peripheral equipment for computers. Emily Vit, the company's new controller, can find only the following partial information for the past two months:

Account/Transaction	July	August
Beginning Materials Inventory	\$ 52,000	\$ e
Beginning Work in Process Inventory	24,000	f
Beginning Finished Goods Inventory	36,000	g
Materials purchased	a	31,000
Direct materials requested	77,000	h
Direct labor costs	b	44,000
Overhead applied	53,200	i
Cost of units completed	c	167,000
Cost of Goods Sold	188,000	j
Ending Materials Inventory	27,000	8,000
Ending Work in Process Inventory	d	k
Ending Finished Goods Inventory	12,000	19,000

The current year's predetermined overhead rate is 110 percent of direct labor cost.

Required

Using the data provided and T accounts, compute the unknown values.

L03 Job Order Costing: T Account Analysis

P 7. Rhile Industries, Inc., produces colorful and stylish nursing uniforms. During September, 2011 Rhile Industries completed the following transactions:

- Sept. 1 Purchased direct materials on account, \$59,400.
 3 Requested direct materials costing \$26,850 for production (all for Job A).
 4 Purchased indirect materials for cash, \$22,830.
 8 Issued checks for the following overhead costs: utilities, \$4,310; manufacturing insurance, \$1,925; and repairs, \$4,640.

- Sept. 10 Requested direct materials costing \$29,510 (all used on Job A) and indirect materials costing \$6,480 for production.
- 15 Recorded the following gross wages and salaries for employees: direct labor, \$62,900 (all for Job A); indirect labor, \$31,610; manufacturing supervision, \$26,900; and sales commissions, \$32,980.
- 15 Applied overhead to production at a rate of 120 percent of direct labor cost.
- 22 Paid the following overhead costs: utilities, \$4,270; maintenance, \$3,380; and rent, \$3,250.
- 23 Recorded the purchase on account and receipt of \$31,940 of direct materials and \$9,260 of indirect materials.
- 27 Requested \$28,870 of direct materials (Job A, \$2,660; Job B, \$8,400; Job C, \$17,810) and \$7,640 of indirect materials for production.
- 30 Recorded the following gross wages and salaries for employees: direct labor, \$64,220 (Job A, \$44,000; Job B, \$9,000; Job C, \$11,220); indirect labor, \$30,290; manufacturing supervision, \$28,520; and sales commissions, \$36,200.
- 30 Applied overhead to production at a rate of 120 percent of direct labor cost.
- 30 Completed and transferred Job A (58,840 units) and Job B (3,525 units) to finished goods inventory; total cost was \$322,400.
- 30 Shipped Job A to the customer; total production cost was \$294,200, and sales price was \$418,240.
- 30 Recorded the following adjusting entries: \$2,680 for depreciation—manufacturing equipment; and \$1,230 for property taxes, manufacturing, payable at month end.

Required

- Record the entries for all Rhile's transactions in September using T accounts for the following: Materials Inventory, Work in Process Inventory, Finished Goods Inventory, Overhead, Cash, Accounts Receivable, Accumulated Depreciation—Manufacturing Equipment, Accounts Payable, Payroll Payable, Property Taxes Payable, Sales, Cost of Goods Sold, and Selling and Administrative Expenses. Use job order cost cards for Job A, Job B, and Job C. Determine the partial account balances. Assume no beginning inventory balances. Assume also that when payroll was recorded, entries were made to the Payroll Payable account. (Round your answers to the nearest whole dollar.)
- Compute the amount of underapplied or overapplied overhead for September and transfer it to the Cost of Goods Sold account.
- Why should the Overhead account's underapplied or overapplied overhead be transferred to the Cost of Goods Sold account?

L03 L04 Job Order Cost Flow

P 8. Laurence Norton is the chief financial officer of Rotham Industries, a company that makes special-order sound systems for home theaters. His records for February revealed the following information:

Beginning inventory balances	
Materials Inventory	\$27,450
Work in Process Inventory	22,900
Finished Goods Inventory	19,200
Direct materials purchased and received	
February 6	\$ 7,200
February 12	8,110
February 24	5,890
Direct labor costs	
February 14	\$13,750
February 28	13,230
Direct materials requested for production	
February 4	\$ 9,080
February 13	5,940
February 25	7,600

Job order cost cards for jobs in process on February 28 had the following totals:

Job No.	Direct Materials	Direct Labor	Overhead
AJ-10	\$3,220	\$1,810	\$2,534
AJ-14	3,880	2,110	2,954
AJ-15	2,980	1,640	2,296
AJ-16	4,690	2,370	3,318

The predetermined overhead rate for the month was 140 percent of direct labor costs. Sales for February totaled \$152,400, which represented a 70 percent markup over the cost of production.

Required

- Using T accounts for Materials Inventory, Work in Process Inventory, Finished Goods Inventory, Overhead, Accounts Receivable, Payroll Payable, Sales, and Cost of Goods Sold, reconstruct the transactions in February.
- Compute the cost of units completed during the month.
- What was the total cost of goods sold during February?
- Determine the ending balances in the inventory accounts.
- During the first week of March, Jobs AJ-10 and AJ-14 were completed. No additional direct materials costs were incurred, but Job AJ-10 needed \$720 more of direct labor, and Job AJ-14 needed an additional \$1,140 of direct labor. Job AJ-10 was 40 units; Job AJ-14, 55 units. Compute the product unit cost for each completed job (round to two decimal places).

L04 Job Order Costing in a Service Organization

P 9. Locust Lodge, a restored 1920s lodge located in Alabama, caters and serves special events for businesses and social occasions. The company earns 60 percent of its revenue from weekly luncheon meetings of local clubs like Rotary. The remainder of its business comes from bookings for weddings and receptions.

Locust Lodge uses job order cost cards to keep track of the costs incurred. Job costs are separated into three categories: food and beverage, labor, and facility overhead. The facility overhead cost for weekly events is 10 percent of food and beverage costs, the facility overhead cost for sit-down receptions is 40 percent of food and beverage costs, and the facility overhead cost for stand-up receptions is 20 percent of food and beverage costs. Accumulated costs for three Locust Lodge clients in the current quarter are as follows:

	Food and Beverage	Labor	Facility Overhead
Tuesday Club meetings	Last month: \$2,000	Last month: \$200	Last month: ?
	This month: \$2,500	This month: \$250	This month: ?
Doar-Turner engagement and wedding parties	Last month: \$3,000	Last month: \$1,000	Last month: ?
	This month: \$8,000	This month: \$2,000	This month: ?
	Both sit-down affairs		
Reception for the new president	This month: \$5,000 A stand-up affair	This month: \$1,000	This month: ?

The number of attendees served at Tuesday Club meetings is usually 200 per month. The Doar-Turner parties paid for 500 guests. The organizers of the reception for the new president paid for 1,000 invitees.

Required

- Using the format shown in this chapter's Review Problem, create a job order cost card for each of the three clients.
- Calculate the total cost of each of the three jobs on its job order cost card.
- Calculate the cost per attendee for each job.
- Rank the jobs in order from most costly to least costly based on each job's total cost and on the cost per attendee. From the rankings of cost, what observations are you able to make?
- Speculate on the price that Locust Lodge should charge for such jobs.

Manager insight ►

Manager insight ►

LO4 Job Order Costing in a Service Organization

P 10. Refer to assignment **P 5** in this chapter. Peruga Engineering Company needs to analyze its jobs in process during the month of January.

Required

- Using Excel's Chart Wizard and the job order cost cards that you created for Jobs P-12, P-15, and P-19, prepare a bar chart that compares the bid and proposal costs, design costs, and prototype development costs of the jobs. The suggested format to use for the information table necessary to complete the bar chart is as follows:

	A	B	C	D	E
1	1		P-12	P-15	P-19
2	2	Bid and proposal			
3	3	Design			
4	4	Prototype development			
5	5	Total job cost			
6					

- Examine the chart you prepared in requirement **1**. List some reasons for the differences between the costs of the various jobs.

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 Interpreting Nonfinancial Data

C 1. Eagle Manufacturing supplies engine parts to Cherokee Cycle Company, a major U.S. manufacturer of motorcycles. Like all of Cherokee's suppliers, Eagle has always added a healthy profit margin to its cost when quoting selling prices to Cherokee. Recently, however, several companies have offered to supply engine parts to Cherokee for lower prices than Eagle has been charging.

Because Eagle Manufacturing wants to keep Cherokee Cycle Company's business, a team of Eagle's managers analyzed their company's product costs and decided to make minor changes in the company's manufacturing process. No new equipment was purchased, and no additional labor was required. Instead, the machines were rearranged, and some of the work was reassigned.

To monitor the effectiveness of the changes, Eagle introduced three new performance measures to its information system: inventory levels, lead time (total time required for a part to move through the production process), and productivity (number of parts manufactured per person per day). Eagle's goal was to reduce the quantities of the first two performance measures and to increase the quantity of the third.

A section of a recent management report, shown below, summarizes the quantities for each performance measure before and after the changes in the manufacturing process were made.

Measure	Before	After	Improvement
Inventory in dollars	\$21,444	\$10,772	50%
Lead time in minutes	17	11	35%
Productivity (parts per person per day)	515	1,152	124%

1. Do you believe that Eagle improved the quality of its manufacturing process and the quality of its engine parts? Explain your answer.
2. Can Eagle lower its selling price to Cherokee? Explain your answer.
3. Did the introduction of the new measures affect the design of the product costing system? Explain your answer.
4. Do you believe that the new measures caused a change in Eagle's cost per engine part? If so, how did they cause the change?

LO1 LO2 Product Costing Systems and Nonfinancial Data

C 2. Refer to the information in **C 1**. Jordan Smith, the president of Eagle Manufacturing, wants to improve the quality of the company's operations and products. She believes waste exists in the design and manufacture of standard engine parts. To begin the improvement process, she has asked you to (1) identify the sources of such waste, (2) develop performance measures to account for the waste, and (3) estimate the current costs associated with the waste. She has asked you to submit a memo of your findings within two weeks so that she can begin strategic planning to revise the price at which Eagle sells engine parts to Cherokee.

You have identified two sources of costly waste. The Production Department is redoing work that was not done correctly the first time, and the Engineering Design Department is redesigning products that were not initially designed to customer specifications. Having improper designs has caused the company to buy parts that are not used in production. You have also obtained the following information from the product costing system:

Direct labor costs	\$673,402
Engineering design costs	124,709
Indirect labor costs	67,200
Depreciation on production equipment	84,300
Supervisors' salaries	98,340
Direct materials costs	432,223
Indirect materials costs	44,332

1. In preparation for writing your memo, answer the following questions:
 - a. For whom are you preparing the memo? What is the appropriate length of the memo?
 - b. Why are you preparing the memo?
 - c. What information is needed for the memo? Where can you get this information? What performance measure would you suggest for each activity? Is the accounting information sufficient for your memo?
 - d. When is the memo due? What can be done to provide accurate and timely information?
2. Prepare an outline of the sections you would want to include in your memo.

L03 Job Order Costing

C3. Many businesses accumulate costs for each job performed. Examples of businesses that use a job order costing system include print shops, car repair shops, health clinics, and kennels.

Visit a local business that uses job order costing, and interview the owner, manager, or accountant about the job order process and the documents the business uses to accumulate product costs. Write a paper that summarizes the information you obtained. Include the following in your summary:

1. The name of the business and the type of operations performed
2. The name and position of the individual you interviewed
3. A description of the process of starting and completing a job
4. A description of the accounting process and the documents used to track a job
5. Your responses to these questions:
 - a. Did the person you interviewed know the actual amount of direct materials, direct labor, and overhead charged to a particular job? If the job includes some estimated costs, how are the estimates calculated? Do the costs affect the determination of the selling price of the product or service?
 - b. Compare the documents discussed in this chapter with the documents used by the company you visited. How are they similar, and how are they different?
 - c. In your opinion, does the business record and accumulate its product costs effectively? Explain.

L04 Costing Procedures and Ethics

C 4. Kevin Rogers, the production manager of Stitts Metal Products Company, entered the office of controller Ed Harris and asked, “Ed, what gives here? I was charged for 330 direct labor hours on Job AD22, and my records show that we spent only 290 hours on that job. That 40-hour difference caused the total cost of direct labor and overhead for the job to increase by over \$5,500. Are my records wrong, or was there an error in the direct labor assigned to the job?”

Harris replied, “Don’t worry about it, Kevin. This job won’t be used in your quarterly performance evaluation. Job AD22 was a federal government job, a cost-plus contract, so the more costs we assign to it, the more profit we make. We decided to add a few hours to the job in case there is some follow-up work to do. You know how fussy the feds are.” What should Kevin Rogers do? Discuss Ed Harris’s costing procedure.

L01 L04 Role of Cost Information in Software Development

C 5. Software development companies frequently have a problem: When is “good enough” good enough? How many hours should be devoted to developing a new product? The industry’s rule of thumb is that developing and shipping new software takes six to nine months. To be the first to market, a company must develop and ship products much more quickly than the industry norm. One performance measure that is used to answer the “good enough” question is a calculation based on the economic value (not cost) of what a company’s developers create. The computation takes the estimated current market valuation of a firm and divides it by the number of product developers in the firm, to arrive at the market value created per developer. Some companies refine this calculation further to determine the value that each developer creates per workday. One company has estimated this value to be \$10,000. Thus, for one software development company, “good enough” focuses on whether a new product’s potential justifies an investment of time by someone who is worth \$10,000 per day.

The salary cost of the company’s developers is not used in the “good enough” calculation. Why is that cost not relevant?

L04 Cookie Company (Continuing Case)

C 6. In the “Cookie Company” case in the last chapter, your team selected a cookie recipe for your company. In this chapter, your team will use that recipe to bake a batch of cookies, collect cost and time performance data related to the baking, create a marketing display for your company, and vote for the class’s favorite cookie during an in-class cookie taste test. The goal of the taste test is to have your team’s product voted the “best in class.” One rule of the contest is that you may not vote for your own team’s product.

1. Design a job measurement document that includes at least the following measures: cost per cookie; number of cookies produced (= number meeting specs + number rejected + number sampled for quality control + unexplained differences); size of cookies before baking; size of cookies after baking; and total throughput time (= mix time + [bake time for one cookie sheet × number of cookie sheets processed] + packaging time + downtime + cleanup time).
2. Design a job order cost card for your company that resembles one of those displayed in this chapter.
3. Using the recipe your team selected and assigning duties as described in the last chapter, bake a batch of cookies, and complete the job measurement document and job order cost card.
 - Assume an overhead rate of \$2 for every \$1 of direct material cost.
 - Assign direct labor cost for each production task based on the hourly rate or a monthly salary previously determined by your team.

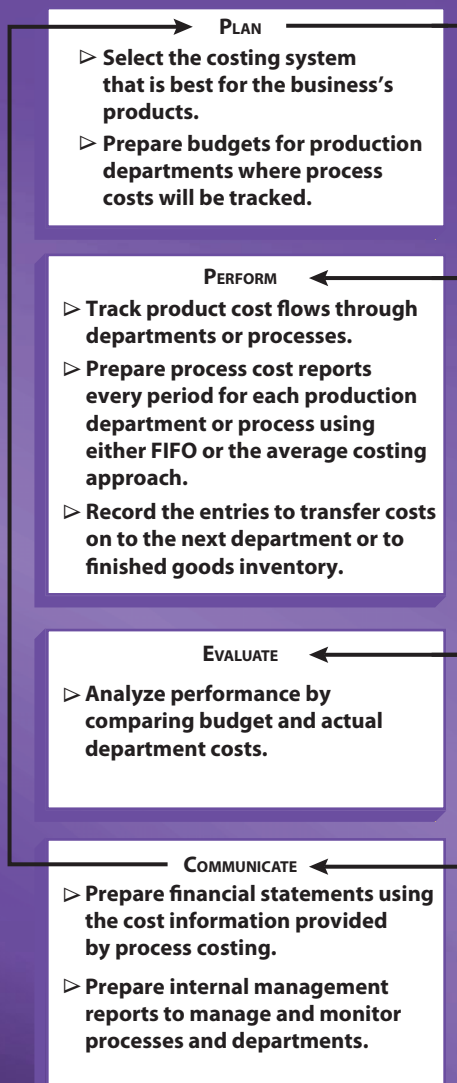
4. Create a marketing display for your cookie product, and bring it to class on the day of the taste test. The marketing display should include 20 cookies on a plate or napkin and a poster that displays your company's name and mission statement, cookie recipe, job measurement document, and job order cost card.
5. During class, each student should look at all the marketing displays, taste 2 or 3 cookies and, on a ballot provided by your instructor, rank taste test results by giving 1 to the best cookie tasted, 2 to the next best, and so on. Students must sign their ballots before they turn them in to the instructor. (Remember, you cannot cast a vote for your own team's entry.) Your instructor will tabulate the ballots and announce the winning team.
6. Finally, write a review of your team members' efforts, and give it to your instructor.

CHAPTER

4

Costing Systems: Process Costing

The Management Process



Companies that produce identical products use a process costing system to account for costs and determine unit cost.

As we noted in the previous chapter, a product costing system is expected to provide unit cost information, to supply cost data for management decisions, and to furnish ending values for the Materials Inventory, Work in Process Inventory, and Finished Goods Inventory accounts. In this chapter, we focus on the process costing system, which is used by companies that make large amounts of similar products or liquid products. We also describe product flow patterns, equivalent production, and the preparation of process cost reports.

LEARNING OBJECTIVES

- L01** Describe the process costing system, and identify the reasons for its use. (pp. 130–131)
- L02** Relate the patterns of product flows to the cost flow methods in a process costing environment, and explain the role of the Work in Process Inventory accounts. (pp. 131–133)
- L03** Define *equivalent production*, and compute equivalent units. (pp. 133–136)
- L04** Prepare a process cost report using the FIFO costing method. (pp. 136–143)
- L05** Prepare a process cost report using the average costing method. (pp. 143–147)

DECISION POINT ► A MANAGER'S FOCUS DEAN FOODS

Dean Foods is the largest milk processor and distributor of milk and other dairy products in the United States. Its products are made in over 100 plants under such popular brands as Meadow Gold, Land of Lakes, Pet, Garelick Farms, Silk, and Horizon Organic. In this chapter we explain why a company like Dean Foods should use a process costing system to provide managers with relevant information. To learn more about Dean Foods go to <http://www.deanfoods.com>

- Why is a process costing system appropriate for Dean Foods?
- How does a process costing system facilitate management decisions?



The Process Costing System

LO1 Describe the process costing system, and identify the reasons for its use.

Study Note

In process costing, costs are traced to production processes, whereas in job order costing, costs are traced to jobs.

As we noted earlier, a **process costing system** is a product costing system used by companies that make large amounts of similar products or liquid products or that have long, continuous production runs of identical products. Companies that produce paint, beverages, chocolate syrup, computer chips, milk, paper, and gallon containers of ice cream are typical users of a process costing system.

Since one gallon of chocolate ice cream is identical to the next gallon, they should cost the same amount to produce. A process costing system first accumulates the costs of direct materials, direct labor, and overhead for each process, department, or work cell and then assigns those costs to the products produced during a particular period.

Managers use process costing in every stage of the management process:

- ▶ When managers plan, they use information about past and projected product costing and customer preferences to decide what a product should cost. After they have determined a target number of units to be sold, all product-related costs for that targeted number of units can be computed and used in the budget.
- ▶ During the period, managers track product and cost flows through their departments or processes and prepare process cost reports to assign production costs to the products manufactured.
- ▶ When managers evaluate performance, they compare targeted costs with actual costs. If costs have exceeded expectations, managers analyze why this has occurred and adjust their planning and decision-making strategies.
- ▶ When managers communicate with external stakeholders, they use actual units produced and costs incurred to value inventory on the balance sheet and cost of goods sold on the income statement. Managers are also interested in internal reports on whether goals for product costs are being achieved.



FOCUS ON BUSINESS PRACTICE

What Kinds of Companies Use Process Costing?

Process costing is appropriate for companies in many types of industries. The following list provides some examples:

<i>Industry</i>	<i>Company</i>	<i>Industry</i>	<i>Company</i>
Aluminum	Alcoa, Inc.	Foods	Kellogg Company
Beverages	Coors	Machinery	Caterpillar Inc.
Building materials	Owens Corning	Oil and gas	ExxonMobil
Chemicals	Dow Chemicals	Plastic products	Tupperware
Computers	Apple Computer	Soft drinks	Coca-Cola

STOP & APPLY >

Indicate whether the manufacturer of each of the following products should use a job order costing system or a process costing system to accumulate product costs:

- a. Milk bottles
- b. Chocolate milk
- c. Nuclear submarines
- d. Generic drugs

SOLUTION

a. Process; b. Process; c. Job order; d. Process

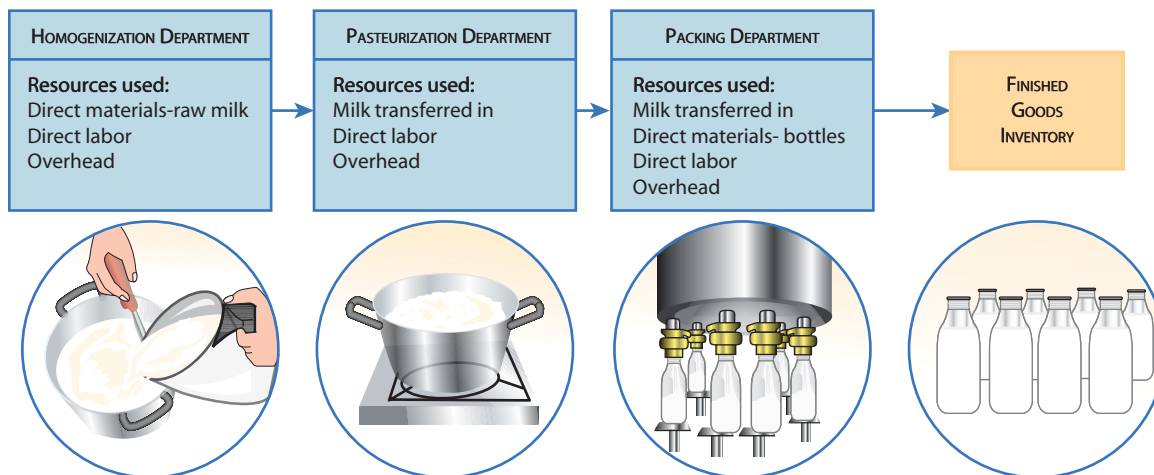
Patterns of Product Flows and Cost Flow Methods

LO2 Relate the patterns of product flows to the cost flow methods in a process costing environment, and explain the role of the Work in Process Inventory accounts.

During production in a process costing environment, products flow in a first-in, first-out (FIFO) fashion through several processes, departments, or work cells, and they may undergo many different combinations of operations. Figure 4-1 illustrates a simple linear production flow; it shows how milk is produced in a series of three processing steps, or departments. Each department has its own Work in Process Inventory account to accumulate the direct material, direct labor, and overhead costs associated with it.

- ▶ Homogenization department: Raw milk from the cow must be mixed to evenly distribute the butterfat. The homogenized milk and its associated cost then become the direct materials for the next department.
- ▶ Pasteurization department: The homogenized milk is heated to 145 degrees to kill the bacteria found in raw milk. The homogenized, pasteurized milk and all associated costs are then transferred to the packaging department.

FIGURE 4-1 Product Flows in a Process Costing Environment



- ▶ **Packaging department:** The milk is put into bottles and transferred to Finished Goods Inventory since it is now ready for sale.

The product unit cost of a bottle of milk is the sum of the cost elements in all three departments.

Process costing environments can be more or less complex than the one we have just described, but even in simple process costing environments, production generally involves a number of separate manufacturing processes, departments, or work cells. For example, the separate processes involved in manufacturing cookies include the mixing department, the baking department, and the packaging department.

As products pass through each manufacturing process, department, or work cell, the process costing system accumulates their costs and passes them on to the next process, department, or work cell. At the end of every accounting period, each manufacturing process, department, or work cell generates a report that assigns the costs that have accumulated during the period to the units that have transferred out of it and to the units that are still a part of its work in process. Managers use this report, called a **process cost report**, to assign costs by using a cost allocation method, such as the FIFO (first-in, first-out) costing method or the average costing method.

- ▶ In the **FIFO costing method**, the cost flow follows the logical physical flow of production—that is, the costs assigned to the first materials processed are the first costs transferred out when those materials flow to the next process, department, or work cell. Thus, in Figure 4-1, the costs assigned to the homogenized milk would be the first costs transferred to the pasteurization department.
- ▶ In contrast, the **average costing method** assigns an average cost to all products made during an accounting period; this method thus uses total cost averages and does not try to match cost flow with the physical flow of production.

We discuss process cost reports that use the FIFO and average costing methods later in this chapter.

Cost Flows Through the Work in Process Inventory Accounts

As we pointed out in the last chapter, a job order costing system uses a single Work in Process Inventory account. In contrast, a process costing system has a separate Work in Process Inventory account for each process, department, or work cell. These accounts are the focal point of process costing. As products move from one process, department, or work cell to the next, the costs of the direct materials, direct labor, and overhead associated with them flow to the Work in Process Inventory account of that process, department, or work cell. The entry in journal form to record the transfer of product costs from one process, department, or work cell to another is:

	Dr.	Cr.
Work in Process Inventory (next department)	XX	
Work in Process Inventory (this department)		XX

Once the products are completed, packaged, and ready for sale, their costs are transferred to the Finished Goods Inventory account. The entry in journal form to record the transfer of the completed product costs out of Work in Process Inventory into Finished Goods Inventory is:

Finished Goods Inventory	Dr.	Cr.
Work in Process Inventory (last department)	XX	XX

As you will learn later in this chapter, the costs associated with these entries are calculated in a process cost report for the process, department, or work cell.

STOP & APPLY >

Milk Smoothies, Inc., uses an automated mixing machine in its Mixing Department to combine three raw materials into a product called Strawberry Smoothie Mix. Total costs charged to the Mixing Department's Work in Process Inventory account during the month were \$210,000. There were no units in beginning or ending work in process inventory. What is the entry in journal form to transfer the units completed to Finished Goods Inventory?

SOLUTION

Finished Goods Inventory	210,000	
Work in Process Inventory (Mixing Department)		210,000

Computing Equivalent Production

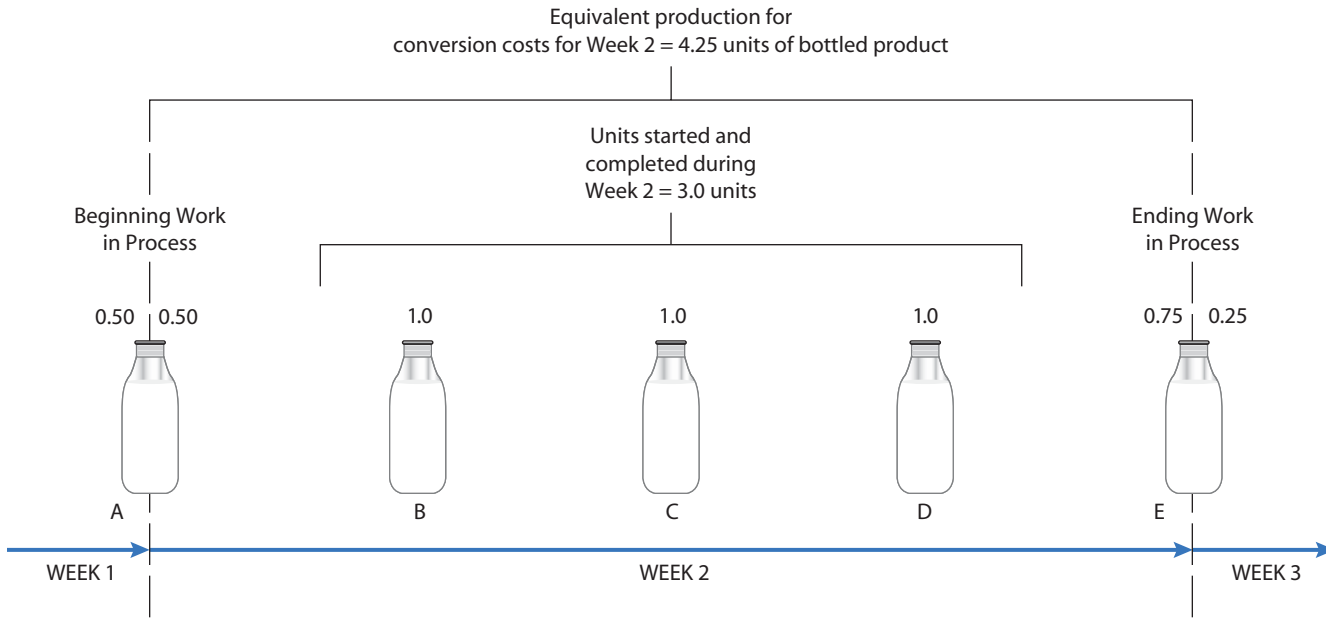
LO3 Define *equivalent production*, and compute equivalent units.

A process costing system makes no attempt to associate costs with particular job orders. Instead, it assigns the costs incurred in a process, department, or work cell to the units worked on during an accounting period by computing an average cost per unit of effort. To compute the unit cost, the total cost of direct materials, direct labor, and overhead is divided by the total number of units worked on during the period. Thus, exactly how many units were worked on during the period is a critical question. Do we count only units started and completed during the period? Or should we include partially completed units in the beginning work in process inventory? And what about incomplete products in the ending work in process inventory?

These questions relate to the concept of equivalent production. **Equivalent production** (also called *equivalent units*) is a measure that applies a percentage-of-completion factor to partially completed units to calculate the equivalent number of whole units produced during a period for each type of input (i.e., direct materials, direct labor, and overhead).

- ▶ The number of equivalent units produced is the sum of (1) total units started and completed during the period and (2) an amount representing the work done on partially completed products in both the beginning and the ending work in process inventories.

FIGURE 4-2 Computation of Equivalent Production



Note: Conversion costs (the cost of direct labor and overhead) are incurred uniformly as each physical unit of drink moves through production. Equivalent production for Week 2 is 4.25 units for conversion costs. But direct materials costs are all added to production at the beginning of the process. Because four physical units of drinks entered production in Week 2, equivalent production for the week is 4.0 units of effort for direct materials costs.

Study Note

Direct materials are sometimes added at stages of production other than the beginning (e.g., chocolate chips are added to batter at the end of the mixing process).

Equivalent production must be computed separately for each type of input because of differences in the ways in which costs are incurred.

- ▶ Direct materials are usually added to production at the beginning of the process.
- ▶ The costs of direct labor and overhead are often incurred uniformly throughout the production process. Thus, it is convenient to combine direct labor and overhead when calculating equivalent units. These combined costs are called **conversion costs** (also called *processing costs*).

We will explain the computation of equivalent production by using a simplified example. One of the products Milk Products Company makes is a pint-sized, bottled milk drink. As illustrated in Figure 4-2, the company started Week 2 with one half-completed drink in process. During Week 2, it started and completed three drinks, and at the end of Week 2, it had one drink that was three-quarters completed.

Equivalent Production for Direct Materials

At Milk Products, all direct materials, including liquids and bottles, are added at the beginning of production. Thus, the drink that was half-completed at the beginning of Week 2 had had all its direct materials added during the previous week.

- ▶ No direct materials costs for this drink are included in the computation of Week 2’s equivalent units for the beginning inventory units.

During Week 2, work began on four new drinks—the three drinks that were completed and the drink that was three-quarters completed at week’s end. Because all direct materials are added at the beginning of the production process, all four drinks were 100 percent complete with regard to direct materials at the end of Week 2.

- ▶ Thus, for Week 2, the equivalent production for direct materials was 4.0 units. This figure includes direct materials for both the 3.0 units that were started and completed and the 1.0 unit that was three-quarters completed.

Study Note

The number of units started and completed is not the same as the total number of units completed during the period. Total units completed include both units in beginning work in process inventory that were completed and units started and completed.

Study Note

Work in the current period is applied to three distinct product groups: units in beginning work in process inventory, which must be completed; goods started and completed during the period; and goods started but not completed by the end of the accounting period.

Equivalent Production for Conversion Costs

Because conversion costs at Milk Products are incurred uniformly throughout the production process, the equivalent production for conversion costs during Week 2 consists of three components: the cost to finish the half-completed unit in beginning work in process inventory (0.50), the cost to begin and finish three completed units (3.0), and the cost to begin work on the three-quarters-completed unit in ending work in process inventory (0.75).

- ▶ For Week 2, the total equivalent production for conversion costs was 4.25 units (0.50 of beginning inventory + 3.0 of units started and completed + 0.75 of ending inventory).

In reality, Milk Products would make many more drinks during an accounting period and would have many more partially completed drinks in its beginning and ending work in process inventories. The number of partially completed drinks would be so great that it would be impractical to take a physical count of them. So, instead of taking a physical count, Milk Products would estimate an average percentage of completion for all drinks in process.

Summary of Equivalent Production

The following is a recap of the current equivalent production for direct materials and conversion costs for the period for Milk Products:

	Physical Units	Equivalent Units of Effort			
		Direct Materials		Conversion Costs	
Beginning inventory	1.00	—	0%	0.50	50%
Units started this period	4.00	3.00	100%	3.00	100%
Units to be accounted for	<u>5.00</u>	1.00	100%	0.75	75%
Beginning inventory	1.00	<u>4.00</u>		<u>4.25</u>	
Units started and completed	3.00				
Ending inventory	<u>1.00</u>				
Units accounted for	<u>5.00</u>				

STOP & APPLY >

Milk Smoothies, Inc., adds direct materials at the start of the production process and adds conversion costs uniformly throughout this process. Given the following information from Milk Smoothie’s records for July, compute the current period’s equivalent units of production:

- Units in beginning inventory: 2,000
- Units started during the period: 13,000
- Units partially completed: 500
- Percentage of completion of beginning inventory: 100% for direct materials; 40% for conversion costs
- Percentage of completion of ending work in process inventory: 100% for direct materials; 70% for conversion costs.

(continued)

SOLUTION

Milk Smoothies, Inc.
For the Month Ended July 31

	Physical Units	Equivalent Units of Effort			
		Direct Materials		Conversion Costs	
Beginning inventory	2,000				
Units started this period	13,000				
Units to be accounted for	15,000				
Beginning inventory	2,000	—	0%	1,200	60%
Units started and completed	12,500	12,500	100%	12,500	100%
Ending inventory	500	500	100%	350	70%
Units accounted for	15,000	13,000		14,050	

Preparing a Process Cost Report Using the FIFO Costing Method

LO4 Prepare a process cost report using the FIFO costing method.

Study Note

The FIFO method focuses on the work done in the current period only.

As we mentioned earlier, a process cost report, such as the one shown in Exhibit 4-1, is a report that managers use to track and analyze costs for a process, department, or work cell in a process costing system. In a process cost report that uses the FIFO costing method, the cost flow follows the logical physical flow of production—that is, the costs assigned to the first products processed are the first costs transferred out when those products flow to the next process, department, or work cell.

five steps. The first two steps account for the units of product being processed:

Step 1. *Account for physical units.*

Step 2. *Account for equivalent units of effort.*

The next two steps account for the costs of the direct materials, direct labor, and overhead being incurred:

Step 3. *Account for the costs incurred.*

Step 4. *Compute the cost per equivalent unit.*

The final step assigns costs to products being transferred out of the area and to those remaining behind in ending work in process inventory:

Step 5. *Assign costs to cost of goods manufactured and ending inventory.*

Accounting for Units

Managers must account for the physical flow of products through their areas (Step 1) before they can compute equivalent production for the accounting period (Step 2). To continue with the Milk Products example, assume the following facts for the accounting period of February:

- ▶ The beginning work in process inventory consists of 6,200 partially completed units (60 percent processed in the previous period).
- ▶ During the period, the 6,200 units in beginning inventory were completed, and 57,500 units were started into production.

EXHIBIT 4-1 Process Cost Report: FIFO Costing Method

Step 1: <i>Account for physical units.</i>		Beginning inventory (units started last period)	6,200				
		Units started this period	<u>57,500</u>				
		Units to be accounted for	<u>63,700</u>				
				Current Equivalent Units of Effort			
				% Incurred		% Incurred	
				Direct	During	Conversion	During
				Materials	Period	Costs	Period
		Physical	Units				
Step 2: <i>Account for equivalent units.</i>		Beginning inventory (units completed this period)	6,200	—	0%	2,480	40%
		Units started and completed this period	52,500	52,500	100%	52,500	100%
		Ending inventory (units started but not completed this period)	<u>5,000</u>	<u>5,000</u>	100%	<u>2,250</u>	45%
		Units accounted for	<u>63,700</u>	<u>57,500</u>		<u>57,230</u>	
Step 3: <i>Account for costs.</i>			Total Costs				
		Beginning inventory	\$ 41,540	=	\$ 20,150	+	\$ 21,390
		Current costs	<u>510,238</u>	=	189,750	+	320,488
		Total costs	<u>\$551,778</u>				
Step 4: <i>Compute cost per equivalent unit.</i>							
		Current Costs			\$189,750		\$320,488
		Equivalent Units			<u>57,500</u>		<u>57,230</u>
		Cost per equivalent unit	<u>\$8.90</u>	=	<u>\$3.30</u>	+	<u>\$5.60</u>
Step 5: <i>Assign costs to cost of goods manufactured and ending inventory.</i>							
		Cost of goods manufactured and transferred out:					
		From beginning inventory	\$ 41,540				
		Current costs to complete	13,888	=	\$0	+	(2,480 × \$5.60)
		Units started and completed this period	<u>467,250</u>	=	(52,500 × \$3.30) +		(52,500 × \$5.60)
		Cost of goods manufactured	\$522,678		<i>(No rounding necessary)</i>		
		Ending inventory	<u>29,100</u>	=	(5,000 × \$3.30) +		(2,250 × \$5.60)
		Total costs	<u>\$551,778</u>				
WORK IN PROCESS INVENTORY ACCOUNT: COST RECAP				WORK IN PROCESS INVENTORY ACCOUNT: UNIT RECAP			
Beg. Bal.	41,540	522,678 (Cost of goods manufactured and transferred out)					
Direct materials	189,750		Beg. Bal.	6,200	58,700 (FIFO units transferred out from the 6,200 in beginning inventory plus the 52,500 started and completed)		
Conversion costs	320,488		Units started	57,500			
End. Bal.	29,100		End. Bal.	5,000			

- ▶ Of the 57,500 units started during the period, 52,500 units were completed. The other 5,000 units remain in ending work in process inventory and are 45 percent complete.

Step 1. In Step 1 of Exhibit 4-1, Milk Products' department manager computes the total units to be accounted for by adding the 6,200 units in beginning inventory to the 57,500 units started into production during this period. These 63,700 units are the actual physical units that the manager is responsible for during the period.

Step 1 continues accounting for physical units. As shown in Exhibit 4-1, the 6,200 units in beginning inventory that were completed during the period, the 52,500 units that were started and finished in the period, and the 5,000 units remaining in the department at the end of the period are summed, and the total is listed as "units accounted for." (Note that the "units accounted for" must equal the "units to be accounted for" in Step 1.)

Step 2. The units accounted for in Step 1 are used to compute equivalent production for the department's direct materials and conversion costs for the month, as described below.

- ▶ **Beginning Inventory** Because all direct materials are added at the beginning of the production process, the 6,200 partially completed units that began February as work in process were already 100 percent complete in regard to direct materials. They were 60 percent complete in regard to conversion costs on February 1. The remaining 40 percent of their conversion costs were incurred as they were completed during the month. Thus, as shown in the "Conversion Costs" column of Exhibit 4-1, the equivalent production for their conversion costs is 2,480 units ($6,200 \times 40\%$).

- ▶ **Units Started and Completed During the Period** All the costs of the 52,500 units started and completed during February were incurred during this accounting period. Thus, the full amount of 52,500 is entered as the equivalent units for both direct materials costs and conversion costs.

- ▶ **Ending Inventory** Because the materials for the 5,000 drinks still in process at the end of February were added when the drinks went into production during the month, the full amount of 5,000 is entered as the equivalent units for direct materials costs. However, these drinks are only 45 percent complete in terms of conversion costs. Thus, as shown in the "Conversion Costs" column of Exhibit 4-1, the equivalent production for their conversion costs is 2,250 units ($5,000 \times 45\%$).

- ▶ **Totals** Step 2 is completed by summing all the physical units to be accounted for, all equivalent units for direct materials costs, and all equivalent units for conversion costs. Exhibit 4-1 shows that for February, Milk Products accounted for 63,700 units. Equivalent units for direct materials costs totaled 57,500, and equivalent units for conversion costs totaled 57,230. Once Milk Products knows February's equivalent unit amounts, it can complete the remaining three steps in the preparation of a process cost report.

Study Note

The percentage of completion for beginning work in process inventory is the amount of work completed during the previous period. Under FIFO, the amount of effort required to complete beginning work in process inventory is the relevant percentage.

Study Note

Units in beginning work in process inventory represent work accomplished in the previous accounting period that has already been assigned a certain portion of its total cost. Those units must be completed in the current period, incurring additional costs.

Accounting for Costs

Thus far, we have focused on accounting for units of productive output—in our example, bottled milk drinks. We now turn our focus to cost information.

- ▶ Step 3 in preparing a process cost report involves accumulating and analyzing all costs charged to the Work in Process Inventory account of each production process, department, or work cell.
- ▶ In Step 4, the cost per equivalent unit for direct materials costs and conversion costs is computed.

The following information about Milk Products' manufacture of drinks during February enables us to complete Steps 3 and 4:

WORK IN PROCESS INVENTORY	
Costs from beginning inventory:	
Direct materials costs	20,150
Conversion costs	21,390
Current period costs:	
Direct materials costs	189,750
Conversion costs	320,488

Step 3. As shown in Exhibit 4-1, all costs for the period are accumulated in the Total Costs column. Beginning inventory's direct materials costs of \$20,150 are added to its conversion costs of \$21,390 to determine the total cost of beginning inventory (\$41,540). Current period costs for direct materials (\$189,750) are added to conversion costs (\$320,488) to determine the total current manufacturing costs (\$510,238). The grand total of \$551,778 is the sum of beginning inventory costs (\$41,540) and current period costs (\$510,238). Notice that only the Total Costs column is totaled. Because only the current period costs for direct materials and conversion are used in Step 4, there is no need to find the total costs of the direct materials and conversion costs columns in Step 3.

Step 4. The direct materials costs and conversion costs for the current period are divided by their respective units of equivalent production to arrive at the cost per equivalent unit. Prior period costs attached to units in beginning inventory are not included in these computations because the FIFO costing method uses a separate costing analysis for each accounting period. (The FIFO method treats the costs of beginning inventory separately, in Step 5.) Exhibit 4-1 shows that the total current cost of \$8.90 per equivalent unit consists of \$3.30 per equivalent unit for direct materials costs ($\$189,750 \div 57,500$ equivalent units) plus \$5.60 per equivalent unit for conversion costs ($\$320,488 \div 57,230$ equivalent units). (Note that the equivalent units are taken from Step 2 of Exhibit 4-1.)

Study Note

The cost per equivalent unit using the FIFO method measures the current cost divided by current effort. Notice in Exhibit 18-1 that the cost of beginning work in process inventory is omitted.

Assigning Costs

Step 5. Step 5 in the preparation of a process costing report uses information from Steps 2 and 4 to assign costs, as shown in Exhibit 4-1. This final step determines the costs that are transferred out either to the

Study Note

The process cost report is developed for the purpose of assigning a value to one transaction: the transfer of goods from one department to another or to finished goods inventory. The ending balance in the Work in Process Inventory account represents the costs that remain after this transfer.

next production process, department, or work cell or to the Finished Goods Inventory account (i.e., the cost of goods manufactured), as well as the costs that remain in the ending balance in the Work in Process Inventory account. The total costs assigned to units completed and transferred out and to ending inventory must equal the total costs in Step 3.

- ▶ **Cost of Goods Manufactured and Transferred Out** Step 5 in Exhibit 4-1 shows that the costs transferred to the Finished Goods Inventory account include the \$41,540 in direct materials and conversion costs for completing the 6,200 units in beginning inventory. Step 2 in the exhibit shows that 2,480 equivalent units of conversion costs were required to complete these 6,200 units. Because the equivalent unit conversion cost for February is \$5.60, the cost to complete the units carried over from January is \$13,888 (2,480 units \times \$5.60).

Each of the 52,500 units started and completed in February cost \$8.90 to produce. Their combined cost of \$467,250 is added to the \$41,540 and \$13,888 of costs required to produce the 6,200 units from beginning inventory to arrive at the total of \$522,678 that is transferred to the Finished Goods Inventory account. The entry resulting from doing the process cost report for February is:

	Dr.	Cr.
Finished Goods Inventory	522,678	
Work in Process Inventory		522,678

Study Note

All costs must be accounted for, including both costs from beginning inventory and costs incurred during the current period. All costs must be assigned to either ending inventory or the goods transferred out.

- ▶ **Ending Inventory** All costs remaining in Milk Products Company's Work in Process Inventory account after the cost of goods manufactured has been transferred out represent the costs of the drinks still in production at the end of February. As shown in Step 5 of Exhibit 4-1, the balance of \$29,100 in the ending Work in Process Inventory is made up of \$16,500 of direct materials costs (5,000 units \times \$3.30 per unit) and \$12,600 of conversion costs (2,250 \times \$5.60 per unit).

Study Note

Rounding product unit costs to even dollars may lead to a significant difference in total costs, giving the impression that costs have been miscalculated. Carry product unit costs to two decimal places where appropriate.

Rounding Differences As you perform Step 5 in any process cost report, remember that the total costs in Steps 3 and 5 must always be the same number. In Exhibit 4-1, for example, they are both \$551,778.

- ▶ If the total costs in Steps 3 and 5 are not the same, first check for omission of any costs and for calculation errors.
- ▶ If that does not solve the problem, check whether any rounding was necessary in computing the costs per equivalent unit in Step 4. If rounding was done in Step 4, rounding differences will occur when assigning costs in Step 5. In that case, adjust the total costs transferred out for any rounding difference so that the total costs in Step 5 equal the total costs in Step 3.

Recap of Work in Process Inventory Account When the process cost report is complete, an account recap may be prepared to show the effects of the report on the Work in Process Inventory account for the period. Two recaps of Milk Products' Work in Process Inventory account for February—one for costs and one for units—appear at the bottom of Exhibit 4-1.

Process Costing for Two or More Production Departments

In our example, Milk Products Company has only one production department for making milk drinks, so it needs only one Work in Process Inventory account. However, a company that has more than one production process or department to make various products must have a Work in Process Inventory account for each process or department.

For instance, when processing raw milk, a milk producer like **Dean Foods**, has a production department for homogenization, another for pasteurization, and another for packaging needs, which requires three Work in Process Inventory accounts.

- ▶ When products flow from the Homogenization Department to the Pasteurization Department, their costs flow from the Homogenization Department's Work in Process Inventory account to the Pasteurization Department's Work in Process Inventory account.
- ▶ The costs transferred into the Pasteurization Department's Work in Process Inventory account are treated in the same way as the cost of direct materials added at the beginning of the production process.
- ▶ When production flows to the Packaging Department, the accumulated costs (incurred in the two previous departments) are transferred to that department's Work in Process Inventory account.
- ▶ At the end of the accounting period, a separate process cost report is prepared for each department.

STOP & APPLY >

Pop Chewing Gum Company produces bubble gum. Direct materials are blended at the beginning of the manufacturing process. No materials are lost in the process, so one kilogram of materials input produces one kilogram of bubble gum. Direct labor and overhead costs are incurred uniformly throughout the blending process.

- ▶ On June 30, 16,000 units were in process. All direct materials had been added, but the units were only 70 percent complete in regard to conversion costs. Direct materials costs of \$8,100 and conversion costs of \$11,800 were attached to the beginning inventory.
- ▶ During July, 405,000 kilograms of materials were used at a cost of \$202,500. Direct labor charges were \$299,200, and overhead costs applied during July were \$284,000.
- ▶ The ending work in process inventory was 21,600 kilograms. All direct materials have been added to those units, and 25 percent of the conversion costs have been assigned. Output from the Blending Department is transferred to the Packaging Department.

Required

1. Prepare a process cost report using the FIFO costing method for the Blending Department for July.
2. Identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred. What is the entry in journal form?

(continued)

SOLUTION

1. FIFO Process Cost Report for the Blending Department for July:

**Pop Chewing Gum Company
Blending Department
Process Cost Report: FIFO Method
For the Month Ended July 31**

Step 1:

<i>Account for physical units.</i>	Beginning inventory (units started last period)	16,000			
	Units started this period	<u>405,000</u>			
	Units to be accounted for	<u>421,000</u>	Current Equivalent Units of Effort		

Step 2:

<i>Account for equivalent units.</i>		<u>Physical Units</u>	<u>Direct Materials</u>	<u>% Incurred During Period</u>	<u>Conversion Costs</u>	<u>% Incurred During Period</u>
	Beginning inventory (units completed this period)	16,000	—	0%	4,800	30%
	Units started and completed this period	383,400	383,400	100%	383,400	100%
	Ending inventory (units started but not completed this period)	<u>21,600</u>	<u>21,600</u>	100%	<u>5,400</u>	25%
	Units accounted for	<u>421,000</u>	<u>405,000</u>		<u>393,600</u>	

Step 3:

<i>Account for costs.</i>		Total Costs			
	Beginning inventory	\$ 19,900	=	\$ 8,100	+
	Current costs	<u>785,700</u>	=	202,500	+
	Total costs	<u>\$805,600</u>			\$ 583,200

Step 4:

<i>Compute cost per equivalent unit.</i>	<u>Current Costs</u>	<u>\$202,500</u>		<u>\$583,200</u>
	Equivalent Units	<u>405,000</u>		<u>393,600</u>
	Cost per equivalent unit	<u>\$1.98</u>	=	<u>\$0.50</u>
			+	<u>\$1.48*</u>

**Rounded to nearest cent.*

Step 5:

<i>Assign costs to cost of goods manufactured and ending inventory.</i>	Cost of goods manufactured and transferred out:				
	From beginning inventory	\$ 19,900			
	Current costs to complete	7,104	=	\$0	+
	Units started and completed this period	<u>759,132</u>	=	(383,400 × \$0.50) + (383,400 × \$1.48)	
	Cost of goods manufactured	<u>\$786,808</u>		<i>[Cost of goods manufactured must be \$786,808 (add rounding of \$672) since Total costs = Ending inventory + Cost of goods manufactured]</i>	
	Ending inventory	<u>18,792</u>	=	(21,600 × \$0.50) + (5,400 × \$1.48)	
	Total costs	<u>\$805,600</u>			

WORK IN PROCESS INVENTORY ACCOUNT: COST RECAP

Beg. Bal.	19,900	786,808 (Cost of goods manufactured and transferred out)
Direct materials	202,500	
Conversion costs	583,200	
End. Bal.	18,792	

WORK IN PROCESS INVENTORY ACCOUNT: UNIT RECAP

Beg. Bal.	16,000	399,400 (FIFO units transferred out from the 16,000 in beginning inventory plus the 383,400 started and completed)
Units started	405,000	
End. Bal.	21,600	

(continued)

2. The amount of \$786,808 should be transferred to the Work in Process Inventory account of the Packaging Department. The entry in journal form is:

Work in Process Inventory (Packaging Department)	786,808	
Work in Process Inventory (Blending Department)		786,808

Preparing a Process Cost Report Using the Average Costing Method

LO5 Prepare a process cost report using the average costing method.

When a process cost report uses the average costing method, cost flows do not follow the logical physical flow of production as they do when the FIFO method is used. Instead, the costs in beginning inventory are combined with current period costs to compute an average product unit cost. Preparing a process cost report using the average costing method involves the same five steps as preparing one using the FIFO method, but the procedures for completing the steps differ.

We now return to the example of Milk Products Company making milk drinks, but this time we assume that Milk Products uses the average costing method of process costing.

Accounting for Units

Step 1. Step 1 of a process cost report, which accounts for the physical units in a production process, department, or work cell during an accounting period, is identical for the average costing and FIFO costing methods. The physical units in beginning inventory are added to the physical units started during the period to arrive at “units to be accounted for.” In Step 1 of Exhibit 4-2, Milk Products’ department manager computes the 63,700 total units to be accounted for by adding the 6,200 units in beginning inventory to the 57,500 units started into production in this period.

Step 2. Step 2 also accounts for production during the period in terms of units. After the number of units completed and transferred to finished goods inventory and the number of units in ending inventory have been added to arrive at “units accounted for,” the equivalent units in terms of direct materials costs and conversion costs are computed, as described below.

- ▶ **Units Completed and Transferred Out** As you can see in Exhibit 4-2, the average costing method treats both the direct materials costs and the conversion costs of the 58,700 units completed in February (6,200 units from beginning inventory + 52,500 started this period) as if they were incurred in the current period. Thus, the full amount of 58,700 is entered as the equivalent units for these costs. In contrast, as shown in Exhibit 4-1, the FIFO costing method disregards the previous period costs of units started in the last period and calculates only the equivalent units required in the current period to complete the units in beginning inventory.
- ▶ **Ending Inventory** The average costing method treats ending inventory in exactly the same way as the FIFO costing method. Because all direct materials are added at the beginning of the production process, the full amount of 5,000 is entered as the equivalent units for direct materials cost. Because the 5,000 units in ending inventory are only 45 percent complete in terms of conversion costs, the amount of equivalent units is 2,250 ($5,000 \times 45\%$).

EXHIBIT 4-2 Process Cost Report: Average Costing Method

Step 1:

<i>Account for physical units.</i>	Beginning inventory (units started last period)	6,200
	Units started this period	<u>57,500</u>
	Units to be accounted for	<u>63,700</u>

Step 2:

		Physical Units	Total Equivalent Units of Effort			
			Direct Materials	% Incurred During Period	Conversion Costs	% Incurred During Period
<i>Account for equivalent units.</i>	Units completed and transferred out	58,700	58,700	100%	58,700	100%
	Ending inventory (units started but not completed this period)	<u>5,000</u>	<u>5,000</u>	100%	<u>2,250</u>	45%
	Units accounted for	<u>63,700</u>	<u>63,700</u>		<u>60,950</u>	

Step 3:

		Total Costs				
<i>Account for costs.</i>	Beginning inventory	\$ 41,540	=	\$ 20,150	+	\$ 21,390
	Current costs	<u>510,238</u>	=	<u>189,750</u>	+	<u>320,488</u>
	Total costs	<u>\$551,778</u>		<u>\$209,900</u>		<u>\$341,878</u>

Step 4:

<i>Compute cost per equivalent unit.</i>	Total Costs			\$209,900		\$341,878
	Equivalent Units			<u>63,700</u>		<u>60,950</u>
	Cost per equivalent unit	<u>\$8.91</u>	=	<u>\$3.30*</u>	+	<u>\$5.61*</u>
				<i>*Rounded to nearest cent.</i>		<i>*Rounded to nearest cent.</i>

Step 5:

<i>Assign costs to cost of goods manufactured and ending inventory</i>	Cost of goods manufactured and transferred out	\$522,655	=	(58,700 × \$3.30)	+	(58,700 × \$5.61)
				<i>[Cost of goods manufactured must be \$522,655 (less rounding of \$362) since Total costs = Ending inventory + Cost of Goods Manufactured]</i>		
	Ending inventory	29,123*	=	(5,000 × \$3.30)	+	(2,250 × \$5.61)
				<i>*Rounded.</i>		
	Total costs	<u>\$551,778</u>				

WORK IN PROCESS INVENTORY ACCOUNT: COST RECAP

Beg. Bal.	41,540	522,655 (Cost of goods manufactured and transferred out)
Direct materials	189,750	
Conversion costs	320,488	
End. Bal.	29,123	

WORK IN PROCESS INVENTORY ACCOUNT: UNIT RECAP

Beg. Bal.	6,200	58,700 (Units transferred out)
Units started	57,500	
End. Bal.	5,000	

- ▶ **Totals** Whether the FIFO costing method or the average costing method is used, Step 2 in a process cost report is completed by summing all the physical units to be accounted for, all equivalent units for direct materials costs, and all equivalent units for conversion costs. Exhibit 4-2 shows that for the month of February, Milk Products accounted for 63,700 physical units. Equivalent units for direct materials costs totaled 63,700, and equivalent units for conversion costs totaled 60,950.

Accounting for Costs

As we noted in our discussion of process cost reports that use the FIFO method, Step 3 of the report accumulates and analyzes all costs in the Work in Process Inventory account, and Step 4 computes the cost per equivalent unit for direct materials costs and conversion costs. You may recall from the discussion that the costs of Milk Products' beginning inventory were \$20,150 for direct materials and \$21,390 for conversion. Current period costs were \$189,750 for direct materials and \$320,488 for conversion.

Step 3. If you compare Exhibit 4-2 with Exhibit 4-1, you will see that the average costing and FIFO costing methods deal with Step 3 in the same manner. All direct materials costs and conversion costs for beginning inventory and the current period are accumulated in the Total Costs column. The total of \$551,778 consists of \$209,900 in direct materials costs and \$341,878 in conversion costs.

Step 4. Step 4 computes the cost per equivalent unit for direct materials costs and conversion costs by dividing the total of these costs by their respective equivalent units. The \$8.91 total cost per equivalent unit consists of \$3.30 per equivalent unit for direct materials ($\$209,900 \div 63,700$ equivalent units) plus \$5.61 per equivalent unit for conversion ($\$341,878 \div 60,950$ equivalent units).

- ▶ Notice that the cost per equivalent unit for both direct materials and conversion costs has been rounded to the nearest cent. In this text, any rounding differences are assigned to the units transferred out in Step 5.
- ▶ Notice also that the average costing and FIFO costing methods use different numerators and denominators in Step 4. Average costing divides *total* cost by *total* equivalent units, whereas FIFO divides *current* costs by *current* equivalent units.

Assigning Costs

Step 5. Using information from Steps 2 and 4, Step 5 of a process cost report assigns direct materials and conversion costs to the units transferred out and to the units still in process at the end of the period. As noted above, any rounding issues that arise in completing Step 5 are included in units completed and transferred out. Milk Products completes Step 5 as described next.

- ▶ **Cost of Goods Manufactured and Transferred Out** As shown in Exhibit 4-2, the costs of the units completed and transferred out are assigned by multiplying the equivalent units for direct materials and conversion costs (accounted for in Step 2) by their respective cost per equivalent unit (computed in Step 4) and then totaling these assigned values. Thus, the \$522,655 assigned to cost of goods manufactured and transferred out includes \$193,710 of direct materials costs (58,700 equivalent units \times \$3.30 cost per equivalent unit) plus \$329,307 of

conversion costs (58,700 equivalent units \times \$5.61 cost per equivalent unit). In this case, because the costs per equivalent unit were rounded in Step 4, a rounding difference of \$362 has been deducted from the total cost. The \$522,655 of transferred costs will go to the Finished Goods Inventory account, since the goods are ready for sale. The entry in journal form resulting from doing the process cost report for February is:

	Dr.	Cr.
Finished Goods Inventory	522,655	
Work in Process Inventory		522,655

- ▶ **Ending Inventory** The costs of the units in ending work in process inventory are assigned in the same way as the costs of cost of goods manufactured and transferred out. As you can see in Exhibit 4-2, the total of \$29,123 assigned to ending inventory includes \$16,500 of direct materials costs (5,000 equivalent units \times \$3.30 cost per equivalent unit) plus \$12,623 (rounded) of conversion costs (2,250 equivalent units \times \$5.61 cost per equivalent unit). The \$29,123 will appear as the ending balance in this department's Work in Process Inventory account.

Recap of Work in Process Inventory Account As we noted earlier, when a process cost report is complete, an account recap may be prepared to show the effects of the report on the Work in Process Inventory account for the period. Exhibit 4-2 includes a cost recap and a unit recap of Milk Products' Work in Process Inventory account for February.

STOP & APPLY >

Pop Chewing Gum Company produces bubble gum. Direct materials are blended at the beginning of the manufacturing process. No materials are lost in the process, so one kilogram of materials input produces one kilogram of bubble gum. Direct labor and overhead costs are incurred uniformly throughout the blending process.

- ▶ On June 30, 16,000 units were in process. All direct materials had been added, but the units were only 70 percent complete in regard to conversion costs. Direct materials costs of \$8,100 and conversion costs of \$11,800 were attached to the beginning inventory.
- ▶ During July, 405,000 kilograms of materials were used at a cost of \$202,500. Direct labor charges were \$299,200, and overhead costs applied during July were \$284,000.
- ▶ The ending work in process inventory was 21,600 kilograms. All direct materials have been added to those units, and 25 percent of the conversion costs have been assigned. Output from the Blending Department is transferred to the Packaging Department.

Required

1. Prepare a process cost report using the average costing method for the Blending Department for July.
2. Identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred. What is the entry in journal form?

(continued)

SOLUTION

1. Average Costing Process Cost Report—Blending Department for July:

Pop Chewing Gum Company
Blending Department
Process Cost Report: Average Costing Method
For the Month Ended July 31

Step 1:

<i>Account for physical units.</i>	Beginning inventory (units started last period)	16,000
	Units started this period	<u>405,000</u>
	Units to be accounted for	<u>421,000</u>

		Total Equivalent Units of Effort				
		Physical Units	Direct Materials Costs	% Incurred During Period	Conversion Costs	% Incurred During Period
Step 2: <i>Account for equivalent units.</i>	Units completed and transferred out	399,400	399,400	100%	399,400	100%
	Ending inventory (units started but not completed this period)	<u>21,600</u>	<u>21,600</u>	100%	<u>5,400</u>	25%
	Units accounted for	<u>421,000</u>	<u>421,000</u>		<u>404,800</u>	

Step 3:

<i>Account for costs.</i>		Total Costs				
	Beginning inventory	\$ 19,900	=	\$ 8,100	+	\$ 11,800
	Current costs	<u>785,700</u>	=	<u>202,500</u>	+	<u>583,200</u>
	Total costs	<u>\$805,600</u>		<u>\$210,600</u>		<u>\$595,000</u>

Step 4:

<i>Compute cost per equivalent unit.</i>		<u>Total Costs</u>		<u>\$210,600</u>		<u>\$595,000</u>
		<u>Equivalent Units</u>		<u>421,000</u>		<u>404,800</u>
	Cost per equivalent unit	<u>\$1.97</u>	=	<u>\$0.50*</u>	+	<u>\$1.47*</u>
				*Rounded to nearest cent		*Rounded to nearest cent

Step 5:

<i>Assign costs to cost of goods manufactured and ending inventory.</i>	Cost of goods manufactured and transferred out	\$786,862	=	(399,400	+	(399,400 × \$1.47)
		(Add rounding \$44)		× \$0.50)		
	Ending inventory	<u>18,738</u>	=	(21,600	+	(5,400 × \$1.47)
		× \$0.50)				
	Total costs	<u>\$805,600</u>				

WORK IN PROCESS INVENTORY ACCOUNT: COST RECAP		
Beg. Bal.	19,900	786,862 (Cost of goods manufactured and transferred out)
Direct materials	202,500	
Conversion costs	583,200	
End. Bal.	18,738	

WORK IN PROCESS INVENTORY ACCOUNT: UNIT RECAP		
Beg. Bal.	16,000	399,400 (Units transferred out)
Units started	405,000	
End. Bal.	21,600	

2. The amount of \$786,862 should be transferred to the Work in Process Inventory account of the Packaging Department. The entry in journal form is:

Work in Process Inventory (Packaging Department)	786,862	
Work in Process Inventory (Blending Department)		786,862

A LOOK BACK AT ► DEAN FOODS



The Decision Point at the beginning of this chapter focused on **Dean Foods**, a company known as a leader in the field of milk products. It posed these questions:

- Why is a process costing system appropriate for Dean Foods?
- How does a process costing system facilitate management decisions?

Because there is a continuous flow of similar products during the process of producing milk and milk products, the most appropriate costing system for Dean Foods is a process costing system. Such a system accumulates costs by process, department, or work cell and assigns them to the products as they pass through the production system. A process costing system provides the information that Dean Foods' management needs to make sound product decisions.

Review Problem

Process Costing Using
the FIFO Costing and
Average Costing Methods

LO4 LO5

A company like **Dean Foods** produces several flavors of milk, including chocolate milk. Two basic direct materials, milk and chocolate syrup, are mixed in the Mixing Department to produce chocolate milk. No materials are lost in the process, so one gallon of materials input produces one gallon of chocolate milk. Direct labor and overhead costs are incurred uniformly throughout the mixing process. Assume that 15,000 gallons in process at the beginning of the month. All direct materials had been added, but the units were only two-thirds complete in regard to conversion costs. Direct materials costs of \$19,200 and conversion costs of \$14,400 were attached to the beginning inventory. During the month, 435,000 gallons of materials were used at a cost of \$426,300. Direct labor charges were \$103,000, and overhead costs applied during the month were \$309,000. The ending work in process inventory was 50,000 gallons. All direct materials have been added to those units, and 20 percent of the conversion costs have been assigned. Output from the Mixing Department is transferred to the Packaging Department.

Required

1. Using the FIFO costing method, prepare a process cost report for the Mixing Department for the month.
2. What amount should be transferred out of the Work in Process Inventory account, and where should those dollars be transferred? What is the entry in journal form?
3. Using the average costing method, repeat requirement **1**.
4. Answer the questions in requirement **2** as they apply to the process cost report that you prepared in requirement **3**.

Answers to Review Problem

1. Process cost report prepared using the FIFO costing method:

Mixing Department
Process Cost Report—FIFO Costing Method
For the Month

Beginning inventory	15,000				
Units started this period	<u>435,000</u>				
Units to be accounted for	<u>450,000</u>				
		Current Equivalent Units of Effort			
	Physical Units	Direct Materials Costs	% Incurred During Period	Conversion Costs	% Incurred During Period
Beginning inventory	15,000	—	0%	5,000	33%
Units started and completed	385,000	385,000	100%	385,000	100%
Ending inventory	<u>50,000</u>	<u>50,000</u>	100%	<u>10,000</u>	20%
Units accounted for	<u>450,000</u>	<u>435,000</u>		<u>400,000</u>	
	Total Costs				
Beginning inventory	\$ 33,600	=	\$ 19,200	+	\$ 14,400
Current costs	<u>838,300</u>	=	426,300	+	412,000
Total costs	<u>\$871,900</u>				
Current Costs			<u>\$426,300</u>		<u>\$412,000</u>
Equivalent Units			435,000		400,000
Cost per equivalent unit	<u>\$2.01</u>	=	<u>\$0.98</u>	+	<u>\$1.03</u>
Cost of goods manufactured and transferred out:					
From beginning inventory	\$ 33,600				
Current costs to complete	5,150	=	\$0		(5,000 × \$1.03)
Units started and completed	<u>773,850</u>	=	(385,000 × \$0.98) + (385,000 × \$1.03)		
Cost of goods manufactured	\$812,600				
Ending inventory	<u>59,300</u>	=	(50,000 × \$0.98) + (10,000 × \$1.03)		
Total costs	<u>\$871,900</u>				

2. The amount of \$812,600 should be transferred to the Work in Process Inventory account of the Packaging Department. The entry in journal form is:

Work in Process (Packaging Inventory Department)	812,600	
Work in Process (Mixing Inventory Department)		812,600

3. Process cost report using the average costing method:

**Mixing Department
Process Cost Report—Average Costing Method
For the Month**

Beginning inventory	15,000				
Units started this period	<u>435,000</u>				
Units to be accounted for	<u>450,000</u>				
		Total Equivalent Units of Effort			
	Physical Units	Direct Materials Costs	% Incurred During Period	Conversion Costs	% Incurred During Period
Units completed and transferred out	400,000	400,000	100%	400,000	100%
Ending inventory	<u>50,000</u>	<u>50,000</u>	100%	<u>10,000</u>	20%
Units accounted for	<u>450,000</u>	<u>450,000</u>		<u>410,000</u>	
	Total Costs				
Beginning inventory	\$ 33,600	= \$ 19,200	+	\$ 14,400	
Current costs	<u>838,300</u>	<u>= 426,300</u>	+	<u>412,000</u>	
Total costs	<u>\$871,900</u>	<u>\$445,500</u>		<u>\$426,400</u>	
	<u>Total Costs</u>	<u>\$445,500</u>		<u>\$426,400</u>	
	<u>Equivalent Units</u>	<u>450,000</u>		<u>410,000</u>	
Cost per equivalent unit	<u>\$2.03</u>	<u>= \$0.99</u>	+	<u>\$1.04</u>	
Cost of goods manufactured and transferred out	\$812,000	= (400,000 × \$0.99) + (400,000 × \$1.04)			
Ending inventory	<u>59,900</u>	= (50,000 × \$0.99) + (10,000 × \$1.04)			
Total costs	<u>\$871,900</u>				

4. The amount of \$812,000 should be transferred to the Work in Process Inventory account of the Packaging Department. The entry in journal form is:

Work in Process (Packaging Inventory Department)	812,000	
Work in Process (Mixing Inventory Department)		812,000


STOP & REVIEW >
LO1 Describe the process costing system, and identify the reasons for its use.

A process costing system is a product costing system used by companies that produce large amounts of similar products or liquid products or that have long, continuous production runs of identical products. Because these companies have a continuous production flow, it would be impractical for them to use a job order costing system, which tracks costs to a specific batch of products or a specific job order. In contrast to a job order costing system, a process costing system accumulates the costs of direct materials, direct labor, and overhead for each process, department, or work cell and assigns those costs to the products as they are produced during a particular period.

The product costs provided by a process costing system play a key role in the management process. When managers plan, they use past and projected information about product costs to set selling prices and prepare budgets. Each day, managers use cost information to make decisions about controlling costs, managing the company's volume of activity, ensuring quality, and negotiating prices. Actual costs are incurred as units are produced, so actual unit costs can be computed. When managers evaluate performance results, they compare targeted costs with actual costs. When managers communicate with external stakeholders, they use actual units produced and costs incurred to value inventory on the balance sheet and cost of goods sold on the income statement. They also analyze internal reports that compare the organization's measures of actual and targeted performance to determine whether cost goals for products or services are being achieved.

LO2 Relate the patterns of product flows to the cost flow methods in a process costing environment, and explain the role of the Work in Process Inventory accounts.

During production in a process costing environment, products flow in a first-in, first-out (FIFO) fashion through several processes, departments, or work cells. As they do, the process costing system accumulates their costs and passes them on to the next process, department, or work cell. At the end of every accounting period, the system generates a report that assigns the costs that have accumulated during the period to the units that have transferred out of the process, department, or work cell and to the units that are still work in process. The process cost report may assign costs by using the FIFO costing method, in which the costs assigned to the first products processed are the first costs transferred out when those products flow to the next process, department, or work cell, or the average costing method, which assigns an average cost to all products made during an accounting period.

The Work in Process Inventory accounts are the focal point of a process costing system. Each production process, department, or work cell has its own Work in Process Inventory account. All costs charged to that process, department, or work cell flow into its Work in Process Inventory account. A process cost report prepared at the end of every accounting period assigns the costs that have accumulated during the period to the units that have flowed out of the process, department, or work cell (the cost of goods transferred out) and to the units that are still in process (the cost of ending inventory).

LO3 Define equivalent production, and compute equivalent units.

Equivalent production is a measure that applies a percentage-of-completion factor to partially completed units to compute the equivalent number of whole units produced in an accounting period for each type of input. Equivalent units are computed from (1) units in the beginning work in process inventory and their percentage of completion, (2) units started and completed during the period, and (3) units in the ending work in process inventory and their percentage of completion. The computation of equivalent units differs depending on whether the FIFO method or the average costing method is used.

L04 Prepare a process cost report using the FIFO costing method.

In a process cost report that uses the FIFO costing method, the cost flow follows the logical physical flow of production—that is, the costs assigned to the first products processed are the first costs transferred when those products flow to the next process, department, or work cell. Preparation of a process cost report involves five steps. Steps 1 and 2 account for the physical flow of products and compute the equivalent units of production. Once equivalent production has been determined, the focus of the report shifts to accounting for costs. In Step 3, all direct materials costs and conversion costs for the current period are added to arrive at total costs. In Step 4, the cost per equivalent unit for both direct materials costs and conversion costs is found by dividing those costs by their respective equivalent units. In Step 5, costs are assigned to the units completed and transferred out during the period, as well as to the ending work in process inventory. The costs assigned to units completed and transferred out include the costs incurred in the preceding period and the conversion costs that were needed to complete those units during the current period. That amount is added to the total cost of producing all units started and completed during the period. The result is the total cost transferred out for the units completed during the period. Step 5 also assigns costs to units still in process at the end of the period by multiplying their direct materials costs and conversion costs by their respective equivalent units. The total equals the balance in the Work in Process Inventory account at the end of the period.

L05 Prepare a process cost report using the average costing method.

The average costing method is an alternative method of accounting for production costs in a manufacturing environment characterized by a continuous production flow. The difference between a process costing report that uses the FIFO method and one that uses the average costing method is that the latter does not differentiate when work was done on inventory. When the average costing method is used, the costs in beginning inventory are averaged with the current period costs to compute the product unit costs. These costs are used to value the ending balance in Work in Process Inventory and the goods completed and transferred out of the process, department, or work cell.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Average costing method 132 (L02)

Conversion costs 134 (L03)

Equivalent production 133 (L03)

FIFO costing method 132 (L02)

Process cost report 132 (L02)

Process costing system 130 (L01)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Process Costing Versus Job Order Costing

SE 1. Indicate whether the manufacturer of each of the following products should use a job order costing system or a process costing system to accumulate product costs:

1. Plastics
2. Ocean cruise ships
3. Cereal
4. Medical drugs for veterinary practices

L01 Process Costing Versus Job Order Costing

SE 2. Indicate whether each of the following is a characteristic of job order costing or of process costing:

1. Several Work in Process Inventory accounts are used, one for each department or work cell in the process.
2. Costs are grouped by process, department, or work cell.
3. Costs are measured for each completed job.
4. Only one Work in Process Inventory account is used.
5. Costs are measured in terms of units completed in specific time periods.
6. Costs are assigned to specific jobs or batches of product.

L02 Process Costing and a Work in Process Inventory Account

SE 3. Chemical Pro uses an automated mixing machine in its Mixing Department to combine three raw materials into a product called Triogo. On average, each unit of Triogo contains \$3 of Material X, \$6 of Material Y, \$9 of Material Z, \$2 of direct labor, and \$12 of overhead. Total costs charged to the Mixing Department's Work in Process Inventory account during the month were \$208,000. There were no units in beginning or ending work in process inventory. How many units were completed and transferred to Finished Goods Inventory during the month?

L03 Equivalent Production: FIFO Costing Method

SE 4. Blue Blaze adds direct materials at the beginning of its production process and adds conversion costs uniformly throughout the process. Given the following information from Blue Blaze's records for July and using Steps 1 and 2 of the FIFO costing method, compute the equivalent units of production:

Units in beginning inventory	3,000
Units started during the period	17,000
Units partially completed	2,500
Percentage of completion of ending work in process inventory	100% for direct materials; 70% for conversion costs
Percentage of completion of beginning inventory	100% for direct materials; 40% for conversion costs

L04 Determining Unit Cost: FIFO Costing Method

SE 5. Using the information from **SE 4** and the following data, compute the total cost per equivalent unit:

	Beginning Work in Process	Costs for the Period
Direct materials	\$20,400	\$7,600
Conversion costs	32,490	2,545

L04 Assigning Costs: FIFO Costing Method

SE 6. Using the data in **SE 4** and **SE 5**, assign costs to the units transferred out and to the units in ending inventory for July.

L05 Equivalent Production: Average Costing Method

SE 7. Using the same data as in **SE 4** but Steps 1 and 2 of the average costing method, compute the equivalent units of production for the month.

L05 Determining Unit Cost: Average Costing Method

SE 8. Using the average costing method and the information from **SE 4**, **SE 5**, and **SE 7**, compute the total cost per equivalent unit.

L05 Assigning Costs: Average Costing Method

SE 9. Using the data in **SE 4**, **SE 5**, **SE 7**, and **SE 8** and assuming that Blue Blaze uses the average costing method, assign costs to the units completed and transferred out and to the units in ending inventory for July.

L05 Equivalent Production: Average Costing Method

SE 10. Red Company adds direct materials at the beginning of its production process and adds conversion costs uniformly throughout the process. Given the following information from Red Company's records for July, compute the current period's equivalent units of production for direct materials and conversion costs:

Units in beginning inventory: 2,000

Units started during the period: 13,000

Units partially completed: 500

Percentage of completion of beginning inventory: 100% for direct materials; 40% for conversion costs

Percentage of completion of ending work in process inventory: 100% for direct materials; 70% for conversion costs

Exercises

L01 Process Costing Versus Job Order Costing

E1. Indicate whether the manufacturer of each of the following products should use a job order costing system or a process costing system to accumulate product costs:

1. Paint
2. Fruit juices
3. Tailor-made suits
4. Milk
5. Coffee cups printed with your school insignia
6. Paper
7. Roller coaster for a theme park
8. Posters for a fund-raising event

L02 Use of Process Costing Information

E 2. Tom's Bakery makes a variety of cakes, cookies, and pies for distribution to five major chains of grocery stores in the area. The company uses a standard manufacturing process for all items except special-order cakes. It currently uses a process costing system. Tom, the owner of the company, has some urgent questions, which are listed at the top of the next page. Which of these questions can be answered using information from a process costing system? Which can be best answered using information from a job order costing system? Explain your answers.

1. How much does it cost to make one chocolate cheesecake?
2. Did the cost of making special-order cakes exceed the cost budgeted for this month?
3. What is the value of the pie inventory at the end of June?
4. What were the costs of the cookies sold during June?
5. At what price should Tom's Bakery sell its famous brownies to the grocery store chains?
6. Were the planned production costs of \$3,000 for making pies in June exceeded?

L02 Work in Process Inventory Accounts in Process Costing Systems

E 3. Gilbert, Inc., which uses a process costing system, makes a chemical used as a food preservative. The manufacturing process involves Departments A and B. The company had the following total costs and unit costs for completed production last month, when it manufactured 10,000 pounds of the chemical. Neither Department A nor Department B had any beginning or ending work in process inventories.

	Total Cost	Unit Cost
Department A		
Direct materials	\$10,000	\$1.00
Direct labor	2,600	0.26
Overhead	1,300	0.13
Total costs	<u>\$13,900</u>	<u>\$1.39</u>
Department B		
Direct materials	\$ 3,000	\$0.30
Direct labor	700	0.07
Overhead	1,000	0.10
Total costs	<u>\$ 4,700</u>	<u>\$0.47</u>
Totals	<u>\$18,600</u>	<u>\$1.86</u>

1. How many Work in Process Inventory accounts would Gilbert use?
2. What dollar amount of the chemical's production cost was transferred from Department A to Department B last month?
3. What dollar amount was transferred from Department B to the Finished Goods Inventory account?
4. What dollar amount is useful in determining a selling price for 1 pound of the chemical?

L03 Equivalent Production: FIFO Costing Method

E 4. McQuary Stone Company produces bricks. Although the company has been in operation for only 12 months, it already enjoys a good reputation. During its first 12 months, it put 600,000 bricks into production and completed and transferred 586,000 bricks to finished goods inventory. The remaining bricks were still in process at the end of the year and were 60 percent complete.

The company's process costing system adds all direct materials costs at the beginning of the production process; conversion costs are incurred uniformly throughout the process. From this information, compute the equivalent units of production for direct materials and conversion costs for the company's first year, which ended December 31. Use the FIFO costing method.

L03 Equivalent Production: FIFO Costing Method

E 5. O'Leon Enterprises makes Perfect Shampoo for professional hair stylists. On July 31, it had 5,200 liters of shampoo in process that were 80 percent complete in regard to conversion costs and 100 percent complete in regard to direct materials costs. During August, it put 212,500 liters of direct materials into production. Data for Work in Process Inventory on August 31 were as follows: shampoo, 4,500 liters; stage of completion, 60 percent for conversion costs and 100 percent for direct materials. From this information, compute the equivalent units of production for direct materials and conversion costs for the month. Use the FIFO costing method.

L03 Equivalent Production: FIFO Costing Method

E 6. Paper Savers Corporation produces wood pulp that is used in making paper. The following data pertain to the company's production of pulp during September:

	Tons	Percentage Complete	
		Direct Materials	Conversion Costs
Work in process, Aug. 31	40,000	100%	60%
Placed into production	250,000	—	—
Work in process, Sept. 30	80,000	100%	40%

Compute the equivalent units of production for direct materials and conversion costs for September using the FIFO costing method.

L04 Work in Process Inventory Accounts: Total Unit Cost

E 7. Scientists at Anschutz Laboratories, Inc., have just perfected Dentalite, a liquid substance that dissolves tooth decay. The substance, which is generated by a complex process involving five departments, is very expensive. Cost and equivalent unit data for the latest week are as follows (units are in ounces):

Dept.	Direct Materials		Conversion Costs	
	Dollars	Equivalent Units	Dollars	Equivalent Units
A	\$12,000	1,000	\$33,825	2,050
B	21,835	1,985	13,065	1,005
C	23,896	1,030	20,972	2,140
D	—	—	22,086	2,045
E	—	—	15,171	1,945

From these data, compute the unit cost for each department and the total unit cost of producing 1 ounce of Dentalite.

L04 Determining Unit Cost: FIFO Costing Method

E 8. Reuse Cookware, Inc., manufactures sets of heavy-duty pots. It has just completed production for August. At the beginning of August, its Work in Process Inventory account showed direct materials costs of \$31,700 and conversion costs of \$29,400. The cost of direct materials used in August was \$275,373; conversion costs were \$175,068. During the month, the company started and completed 15,190 sets. For August, a total of 16,450 equivalent sets for direct materials and 16,210 equivalent sets for conversion costs have been computed.

From this information, determine the cost per equivalent set for August. Use the FIFO costing method.

L04 Assigning Costs: FIFO Costing Method

E 9. The Bakery produces tea cakes. It uses a process costing system. In March, its beginning inventory was 450 units, which were 100 percent complete for direct materials costs and 10 percent complete for conversion costs. The cost of beginning inventory was \$655. Units started and completed during the month totaled 14,200. Ending inventory was 410 units, which were 100 percent complete for direct materials costs and 70 percent complete for conversion costs. Costs per equivalent unit for March were \$1.40 for direct materials costs and \$0.80 for conversion costs.

From this information, compute the cost of goods transferred to the Finished Goods Inventory account, the cost remaining in the Work in Process Inventory account, and the total costs to be accounted for. Use the FIFO costing method.

L04 Process Cost Report: FIFO Costing Method

E 10. Toy Country Corporation produces children's toys using a liquid plastic formula and a continuous production process. In the company's toy truck work cell, the plastic is heated and fed into a molding machine. The molded toys are then cooled and trimmed and sent to the packaging work cell. All direct materials are added at the beginning of the process. In November, the beginning work in process inventory was 420 units, which were 40 percent complete; the ending balance was 400 units, which were 70 percent complete.

During November, 15,000 units were started into production. The Work in Process Inventory account had a beginning balance of \$937 for direct materials costs and \$370 for conversion costs. In the course of the month, \$35,300 of direct materials were added to the process, and \$31,760 of conversion costs were assigned to the work cell. Using the FIFO costing method, prepare a process cost report that computes the equivalent units for November, the product unit cost for the toys, and the ending balance in the Work in Process Inventory account.

L05 Equivalent Production: Average Costing Method

E 11. Using the data in **E 4** and assuming that the company uses the average costing method, compute the equivalent units of production for direct materials and conversion costs for the year ended December 31.

L05 Equivalent Production: Average Costing Method

E 12. Using the data in **E 5** and assuming that the company uses the average costing method, compute the equivalent units of production for direct materials and conversion for August.

L05 Equivalent Production: Average Costing Method

E 13. Using the data in **E 6** and assuming that the company uses the average costing method, compute the equivalent units of production for direct materials and conversion for September.

L05 Determining Unit Cost: Average Costing Method

E 14. Using the data in **E 8** and the average costing method, determine the cost per equivalent set for August. Assume equivalent sets are 16,900 for direct materials costs and 17,039 for conversion costs.

L05 Process Cost Report: Average Costing Method

E 15. Using the data in **E 10** and the average costing method, prepare a process cost report that computes the equivalent units for November, the product unit cost for the toys, and the ending balance in the Work in Process Inventory account.

Problems

L04 L05 Process Costing: FIFO Costing and Average Costing Methods

P1. Lightning Industries specializes in making Flash, a high-moisture, low-alkaline wax used to protect and preserve skis. The company began producing a new, improved brand of Flash on January 1. Materials are introduced at the beginning of the production process. During January, 15,300 pounds were used at a cost of \$46,665. Direct labor of \$17,136 and overhead costs of \$25,704 were incurred uniformly throughout the month. By January 31, 13,600 pounds of Flash had been completed and transferred to the finished goods inventory (1 pound of input equals 1 pound of output). Since no spoilage occurred, the leftover materials remained in production and were 40 percent complete on average.

Required

- Using the FIFO costing method, prepare a process cost report for January.
- From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.
- Repeat requirements 1 and 2 using the average costing method.

L04 Process Costing: FIFO Costing Method

P2. Liquid Extracts Company produces a line of fruit extracts for home use in making wine, jams and jellies, pies, and meat sauces. Fruits enter the production process in pounds; the product emerges in quarts (1 pound of input equals 1 quart of output). On May 31, 4,250 units were in process. All direct materials had been added, and the units were 70 percent complete for conversion costs. Direct materials costs of \$4,607 and conversion costs of \$3,535 were attached to the units in beginning work in process inventory. During June, 61,300 pounds of fruit were added at a cost of \$71,108. Direct labor for the month totaled \$19,760, and overhead costs applied were \$31,375. On June 30, 3,400 units remained in process. All direct materials for these units had been added, and 50 percent of conversion costs had been incurred.

Required

- Using the FIFO costing method, prepare a process cost report for June.
- From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.

L04 Process Costing: One Process and Two Time Periods—FIFO Costing Method

P3. Wash Clean Laboratories produces biodegradable liquid detergents that leave no soap film. The production process has been automated, so the product can now be produced in one operation instead of in a series of heating, mixing, and cooling operations. All direct materials are added at the beginning of the process, and conversion costs are incurred uniformly throughout the process. Operating data for July and August are as follows:

	July	August
Beginning work in process inventory		
Units (pounds)	2,300	3,050
Direct materials	\$ 4,699	?*
Conversion costs	\$ 1,219	?*
Production during the period		
Units started (pounds)	31,500	32,800
Direct materials	\$65,520	\$66,912
Conversion costs	\$54,213	\$54,774
Ending work in process inventory		
Units (pounds)	3,050	3,600

*From calculations at end of July.

The beginning work in process inventory was 30 percent complete for conversion costs. The ending work in process inventory for July was 60 percent complete; for August, it was 50 percent complete. Assume that the loss from spoilage and evaporation was negligible.

Required

1. Using the FIFO costing method, prepare a process cost report for July.
2. From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.
3. Repeat requirements 1 and 2 for August.

L05 Process Costing: Average Costing Method and Two Time Periods

P 4. Lid Corporation produces a line of beverage lids. The production process has been automated, so the product can now be produced in one operation rather than in the three operations that were needed before the company purchased the automated machinery. All direct materials are added at the beginning of the process, and conversion costs are incurred uniformly throughout the process. Operating data for May and June are as follows:

	May	June
Beginning work in process inventory		
Units (May: 40% complete)	220,000	?
Direct materials	\$ 3,440	\$ 400
Conversion costs	\$ 6,480	\$ 420
Production during the month		
Units started	24,000,000	31,000,000
Direct materials	\$45,000	\$93,200
Conversion costs	\$66,000	\$92,796
Ending work in process inventory		
Units (May: 70% complete; June: 60% complete)	200,000	320,000

1. Using the average costing method, prepare process cost reports for May and June. (Round unit costs to three decimal places; round all other costs to the nearest dollar.)
2. From the information in the process cost report for May, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.
3. Compare the product costing results for June with the results for May. What is the most significant change? What are some of the possible causes of this change?

L05 Process Costing: Average Costing Method

P 5. Hurricane Products, Inc., makes high-vitamin, calorie-packed wafers that are popular among professional athletes because they supply quick energy. The company produces the wafers in a continuous flow, and it uses a process costing system based on the average costing method. It recently purchased several automated machines so that the wafers can be produced in a single department. All direct materials are added at the beginning of the process. The costs for the machine operators' labor and production-related overhead are incurred uniformly throughout the process.

In February, the company put a total of 231,200 liters of direct materials into production at a cost of \$294,780. Two liters of direct materials were used to produce one unit of output (one unit = 144 wafers). Direct labor costs for February were \$60,530, and overhead was \$181,590. The beginning work in process inventory for February was 14,000 units, which were 100 percent complete for direct materials and 20 percent complete for conversion costs. The total cost of those units was \$55,000, \$48,660 of which was assigned to the cost of

direct materials. The ending work in process inventory of 12,000 units was fully complete for direct materials but only 30 percent complete for conversion costs.

Required

1. Using the average costing method and assuming no loss due to spoilage, prepare a process cost report for February.
2. From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.

Alternate Problems

L04 L05 Process Costing: FIFO Costing and Average Costing Methods

P6. Sunshine Soda Company manufactures and sells several different kinds of soft drinks. Direct materials (sugar syrup and artificial flavor) are added at the beginning of production in the Mixing Department. Direct labor and overhead costs are applied to products throughout the process. For August, beginning inventory for the citrus flavor was 2,400 gallons, 80 percent complete. Ending inventory was 3,600 gallons, 50 percent complete. Production data show 240,000 gallons started during August. A total of 238,800 gallons was completed and transferred to the Bottling Department. Beginning inventory costs were \$600 for direct materials and \$676 for conversion costs. Current period costs were \$57,600 for direct materials and \$83,538 for conversion costs.

Required

1. Using the FIFO costing method, prepare a process cost report for the Mixing Department for August.
2. From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.
3. Repeat requirements 1 and 2 using the average costing method.

L04 Process Costing: FIFO Costing Method

P7. Canned fruits and vegetables are the main products made by Good Foods, Inc. All direct materials are added at the beginning of the Mixing Department's process. When the ingredients have been mixed, they go to the Cooking Department. There the mixture is heated to 100° Celsius and simmered for 20 minutes. When cooled, the mixture goes to the Canning Department for final processing. Throughout the operations, direct labor and overhead costs are incurred uniformly. No direct materials are added in the Cooking Department. Cost data and other information for the Mixing Department for January are as follows:

Production Cost Data	Direct Materials	Conversion Costs
Mixing Department		
Beginning inventory	\$ 28,560	\$ 5,230
Current period costs	450,000	181,200
Work in process inventory		
Beginning inventory		
Mixing Department (40% complete)	5,000 liters	
Ending inventory		
Mixing Department (60% complete)	6,000 liters	
Unit production data		
Units started during January	90,000 liters	
Units transferred out during January	89,000 liters	

Assume that no spoilage or evaporation loss took place during January.

Required

Manager insight ►

- Using the FIFO costing method, prepare a process cost report for the Mixing Department for January.
- Explain how the analysis for the Cooking Department will differ from the analysis for the Mixing Department.

LO4 Process Costing: One Process and Two Time Periods—FIFO Costing Method

P 8. Honey Dews Company produces organic honey, which it sells to health food stores and restaurants. The company owns thousands of beehives. No direct materials other than honey are used. The production operation is a simple one. Impure honey is added at the beginning of the process and flows through a series of filterings, leading to a pure finished product. Costs of labor and overhead are incurred uniformly throughout the filtering process. Production data for April and May are as follows:

	April	May
Beginning work in process inventory		
Units (liters)	7,100	12,400
Direct materials	\$ 2,480	?*
Conversion costs	\$ 5,110	?*
Production during the period		
Units started (liters)	288,000	310,000
Direct materials	\$100,800	\$117,800
Conversion costs	\$251,550	\$277,281
Ending work in process inventory		
Units (liters)	12,400	16,900

*From calculations at end of April.

The beginning work in process inventory for April was 80 percent complete for conversion costs, and ending work in process inventory was 20 percent complete. The ending work in process inventory for May was 30 percent complete for conversion costs. Assume that there was no loss from spoilage or evaporation.

Required

- Using the FIFO method, prepare a process cost report for April.
- From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.
- Repeat requirements 1 and 2 for May.

LO5 Process Costing: Average Costing Method and Two Time Periods

P 9. Carton Corporation produces a line of beverage cartons. The production process has been automated, so the product can now be produced in one operation rather than in the three operations that were needed before the company purchased the automated machinery. All direct materials are added at the beginning of the process, and conversion costs are incurred uniformly throughout the process. Operating data for July and August are as follows:

	July	August
Beginning work in process inventory		
Units (July: 20% complete)	20,000	?
Direct materials	\$20,000	\$6,000
Conversion costs	\$30,000	\$6,000
Production during the month		
Units started	70,000	90,000
Direct materials	\$34,000	\$59,000
Conversion costs	\$96,000	\$130,800
Ending work in process inventory		
Units (July: 40% complete; August: 60% complete)	10,000	25,000

1. Using the average costing method, prepare process cost reports for July and August. (Round unit costs to two decimal places; round all other costs to the nearest dollar.)
2. From the information in the process cost report for July, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.
3. Compare the product costing results for August with the results for July. What is the most significant change? What are some of the possible causes of this change?

L05 Process Costing: Average Costing Method

P 10. Many of the products made by Wireless Plastics Company are standard telephone replacement parts that require long production runs and are produced continuously. A unit for Wireless Plastics is a box of parts. During April, direct materials for 25,250 units were put into production. Total cost of direct materials used during April was \$2,273,000. Direct labor costs totaled \$1,135,000, and overhead was \$2,043,000. The beginning work in process inventory contained 1,600 units, which were 100 percent complete for direct materials costs and 60 percent complete for conversion costs. Costs attached to the units in beginning inventory totaled \$232,515, which included \$143,500 of direct materials costs. At the end of the month, 1,250 units were in ending inventory; all direct materials had been added, and the units were 70 percent complete for conversion costs.

Required

1. Using the average costing method and assuming no loss due to spoilage, prepare a process cost report for April.
2. From the information in the process cost report, identify the amount that should be transferred out of the Work in Process Inventory account, and state where those dollars should be transferred.

ENHANCING Your Knowledge, Skills, and Critical Thinking

L01 Concept of Process Costing Systems

C 1. For more than 60 years, **Dow Chemical Company** has made and sold a tasteless, odorless, and calorie-free substance called Methocel. When heated, this liquid plastic (methyl cellulose) has the unusual characteristic (for plastics) of becoming a gel that resembles cooked egg whites. It is used in over 400 food products, including gravies, soups, and puddings. It was also used as wampa drool in *The Empire Strikes Back* and dinosaur sneeze in *Jurassic Park*. What kind of costing system is most appropriate for the manufacture of Methocel? Why is that system most appropriate? Describe the system, and include in the description a general explanation of how costs are determined.

L01 L02 Continuing Professional Education

C 2. Paula Woodward is the head of the Information Systems Department at Moreno Manufacturing Company. Roland Randolph, the company's controller, is meeting with her to discuss changes in data gathering that relate to the company's new flexible manufacturing system. Woodward opens the conversation by saying, "Roland, the old job order costing methods just will not work with the new flexible manufacturing system. The new system is based on continuous product flow,

not batch processing. We need to change to a process costing system for both data gathering and product costing. Otherwise, our product costs will be way off, and it will affect our pricing decisions. I found out about the need for this change at a professional seminar I attended last month. You should have been there with me.”

Randolph responds, “Paula, who is the accounting expert here? I know what product costing approach is best for this situation. Job order costing has provided accurate information for this product line for more than 15 years. Why should we change just because we’ve purchased a new machine? We’ve purchased several machines for this line over the years. And as for your seminar, I don’t need to learn about costing methods. I was exposed to them all when I studied management accounting back in the late 1970s.”

Is Randolph’s behavior ethical? If not, what has he done wrong? What can Woodward do if Randolph continues to refuse to update the product costing system?

L03 L04 Analysis of Product Cost

C 3. Ready Tire Corporation makes several lines of automobile and truck tires. The company operates in a competitive marketplace, so it relies heavily on cost data from its FIFO-based process costing system. It uses that information to set prices for its most competitive tires. The company’s radial line has lost some of its market share during each of the past four years. Management believes that price breaks allowed by the company’s three biggest competitors are the main reason for the decline in sales.

The company controller, Sara Birdsong, has been asked to review the product costing information that supports pricing decisions on the radial line. In preparing her report, she collected the following data for last year, the most recent full year of operations:

		Units	Dollars
Equivalent units	Direct materials	84,200	
	Conversion costs	82,800	
Manufacturing costs:	Direct materials		\$1,978,700
	Direct labor		800,400
	Overhead		1,600,800
Unit cost data:	Direct materials		23.50
	Conversion costs		29.00
Work in process inventory:			
	Beginning (70% complete)	4,200	
	Ending (30% complete)	3,800	

Units started and completed last year totaled 80,400. Attached to the beginning Work in Process Inventory account were direct materials costs of \$123,660 and conversion costs of \$57,010. Birdsong found that little spoilage had occurred. The proper cost allowance for spoilage was included in the predetermined overhead rate of \$2 per direct labor dollar. The review of direct labor cost revealed, however, that \$90,500 had been charged twice to the production account, the second time in error. This resulted in overly high overhead costs being charged to the production account.

The radial has been selling for \$92 per tire. This price was based on last year’s unit data plus a 75 percent markup to cover operating costs and profit. The company’s three main competitors have been charging about \$87 for a tire of comparable quality. The company’s process costing system adds all direct materials at the beginning of the process, and conversion costs are incurred uniformly throughout the process.

1. Identify what inaccuracies in costs, inventories, and selling prices result from the company’s cost-charging error.

2. Prepare a revised process cost report for last year. Round unit costs to two decimal places. Round total costs to whole dollars.
3. What should have been the minimum selling price per tire this year?
4. Suggest ways of preventing such errors in the future.

LO4 Setting a Selling Price

C4. For the past four years, three companies have dominated the soft drink industry, holding a combined 85 percent of market share. Wonder Cola, Inc., ranks second nationally in soft drink sales. Its management is thinking about introducing a new low-calorie drink called Null Cola.

Wonder soft drinks are processed in a single department. All ingredients are added at the beginning of the process. At the end of the process, the beverage is poured into bottles that cost \$0.24 per case produced. Direct labor and overhead costs are applied uniformly throughout the process.

Corporate controller Adam Daneen believes that costs for the new cola will be very much like those for the company's Cola Plus drink. Last year, he collected the following data about Cola Plus:

	Units*	Costs
Work in process inventory		
January 1 [†]	2,200	
Direct materials costs		\$ 2,080
Conversion costs		620
December 31 [‡]	2,000	
Direct materials costs		1,880
Conversion costs		600
Units started during year	458,500	
Costs for year		
Liquid materials added		430,990
Direct labor and overhead		229,400
Bottles		110,068

*Each unit is a 24-bottle case.

[†]50% complete.

[‡]60% complete.

The company's variable general administrative and selling costs are \$1.10 per unit. Fixed administrative and selling costs are assigned to products at the rate of \$0.50 per unit. Each of Wonder Cola's two main competitors is already marketing a diet cola. Company A's product sells for \$4.10 per unit; Company B's, for \$4.05. All costs are expected to increase by 10 percent in the next three years. Wonder Cola tries to earn a profit of at least 15 percent on the total unit cost.

1. What factors should Wonder Cola, Inc., consider in setting a unit selling price for a case of Null Cola?
2. Using the FIFO costing method, compute (a) equivalent units for direct materials, cases of bottles, and conversion costs; (b) the total production cost per unit; and (c) the total cost per unit of Cola Plus for the year.
3. What is the expected unit cost of Null Cola for the year?
4. Recommend a unit selling price range for Null Cola, and give the reason(s) for your choice.

LO2 LO3 Using the Process Costing System

LO4

C5. You are the production manager for Great Grain Corporation, a manufacturer of four cereal products. The company's best-selling product is Smackaroos, a sugar-coated puffed rice cereal. Yesterday, Clark Winslow, the controller, reported

that the production cost for each box of Smackaroos has increased approximately 22 percent in the last four months. Because the company is unable to increase the selling price for a box of Smackaroos, the increased production costs will reduce profits significantly.

Today, you received a memo from Gilbert Rom, the company president, asking you to review your production process to identify inefficiencies or waste that can be eliminated. Once you have completed your analysis, you are to write a memo presenting your findings and suggesting ways to reduce or eliminate the problems. The president will use your information during a meeting with the top management team in ten days.

You are aware of previous problems in the Baking Department and the Packaging Department. Winslow has provided you with process cost reports for the two departments. He has also given you the following detailed summary of the cost per equivalent unit for a box of Smackaroos cereal:

	April	May	June	July
Baking Department				
Direct materials	\$1.25	\$1.26	\$1.24	\$1.25
Direct labor	0.50	0.61	0.85	0.90
Overhead	0.25	0.31	0.34	0.40
Department totals	<u>\$2.00</u>	<u>\$2.18</u>	<u>\$2.43</u>	<u>\$2.55</u>
Packaging Department				
Direct materials	\$0.35	\$0.34	\$0.33	\$0.33
Direct labor	0.05	0.05	0.04	0.06
Overhead	0.10	0.16	0.15	0.12
Department totals	<u>\$0.50</u>	<u>\$0.55</u>	<u>\$0.52</u>	<u>\$0.51</u>
Total cost per equivalent unit	<u>\$2.50</u>	<u>\$2.73</u>	<u>\$2.95</u>	<u>\$3.06</u>

- In preparation for writing your memo, answer the following questions:
 - For whom are you preparing the memo? Does this affect the length of the memo? Explain.
 - Why are you preparing the memo?
 - What actions should you take to gather information for the memo? What information is needed? Is the information that Winslow provided sufficient for analysis and reporting?
 - When is the memo due? What can be done to provide accurate, reliable, and timely information?
- Based on your analysis of the information that Winslow provided, where is the main problem in the production process?
- Prepare an outline of the sections you would want in your memo.

L01 Cookie Company (Continuing Case)

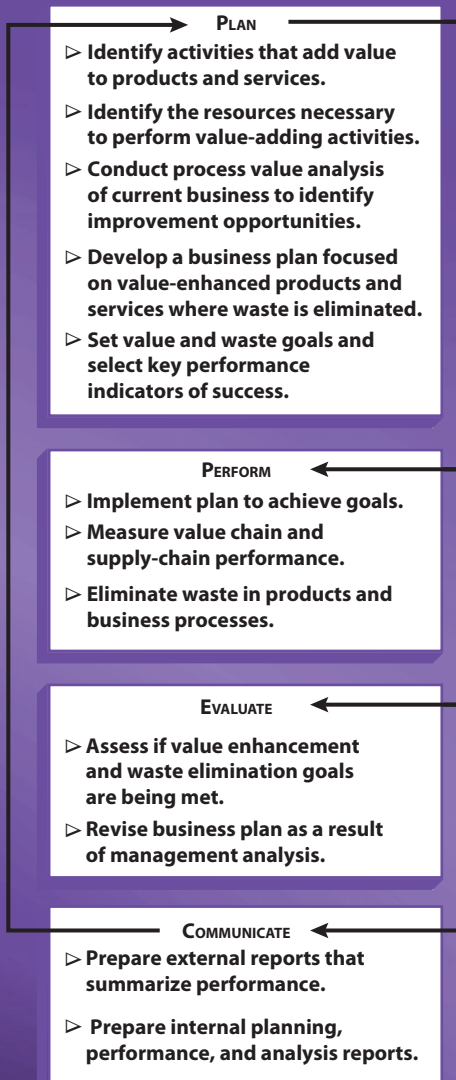
C 6. In this segment of our continuing case, you are considering whether process costing is more appropriate for your cookie company than job order costing. List reasons why your company may choose to use process costing instead of job order costing.

CHAPTER

5

Value-Based Systems: ABM and Lean

The Management Process



Managers can use ABM and/or a lean approach to add value for their customers.

To remain competitive in today's challenging business environment, companies have had to rethink their organizational processes and basic operating methods. Managers focus on creating value for their customers. They design their internal value chain and external supply chain to provide customer-related, activity-based information; to track costs; and to eliminate waste and inefficiencies. In this chapter, we describe two systems that help managers improve operating processes and make better decisions: activity-based management and the lean operating philosophy.

LEARNING OBJECTIVES

- L01** Explain why managers use value-based systems, and discuss the relationship of these systems to the supply chain and value chain. (pp. 168–172)
- L02** Define *activity-based costing*, and explain how a cost hierarchy and a bill of activities are used. (pp. 172–175)
- L03** Define the elements of a lean operation, and identify the changes in inventory management that result when a firm adopts its just-in-time operating philosophy. (pp. 176–180)
- L04** Define and apply *backflush costing*, and compare the cost flows in traditional and backflush costing. (pp. 180–183)
- L05** Compare ABM and lean operations as value-based systems. (p. 184)

DECISION POINT ► **A MANAGER'S FOCUS**
LA-Z-BOY, INC.

La-Z-Boy, Inc., makes thousands of built-to-order sofas and chairs each week in its U.S. plants, and it generally delivers them less than three weeks after customers have placed their orders with a retailer. This gives La-Z-Boy a significant advantage over its competitors. Critical factors in the company's success are the speed of its supply chain and its use of value-based systems.

- How have value-based systems helped La-Z-Boy, Inc., improve its production processes and reduce delivery time?
- How do La-Z-Boy's managers plan to maintain the company's status as the leading manufacturer of upholstered products?



Value-Based Systems and Management

LO1 Explain why managers use value-based systems, and discuss the relationship of these systems to the supply chain and value chain.

Many companies, including **La-Z-Boy, Inc.**, are rethinking how to operate in volatile business environments that are strongly influenced by customer demands. Managers realize that value-based systems, rather than traditional cost-based systems, provide the information they need. **Value-based systems** are information systems that provide customer-related, activity-based information. Value-based systems focus on eliminating waste as companies produce and deliver quality products and services demanded by customers. Managers can use value-based information to compare the value created by products or services with the **full product cost**, which includes not only the costs of direct materials and direct labor, but also the costs of all production and nonproduction activities required to satisfy the customer. For example, the full product cost of a La-Z-Boy recliner or sofa includes the cost of the frame and upholstery, as well as the costs of taking the sales order, processing the order, packaging and shipping the furniture, and providing subsequent customer service for warranty work.

Creating value by satisfying customers' needs for quality, reasonable price, and timely delivery requires that managers do the following:

- ▶ Work with suppliers and customers.
- ▶ View the organization as a collection of value-adding activities.
- ▶ Use resources for value-adding activities.
- ▶ Reduce or eliminate non-value-adding activities.
- ▶ Know the total cost of creating value for a customer.

Each company in a supply chain is a customer of an earlier supplier. The furniture maker shown here would be a customer of a supplier of high-quality wood and perhaps of a metal manufacturer, caning supplier, and leather manufacturer. His customer might be a furniture wholesaler or retail store. The retail store, which sells the furniture to customers, is the final link in the supply chain.

Courtesy of PhotostoGO.com.



If an organization's business plan focuses on providing products or services that customers esteem, then managers will work both externally and internally to manage their supply chain and value chains, respectively.

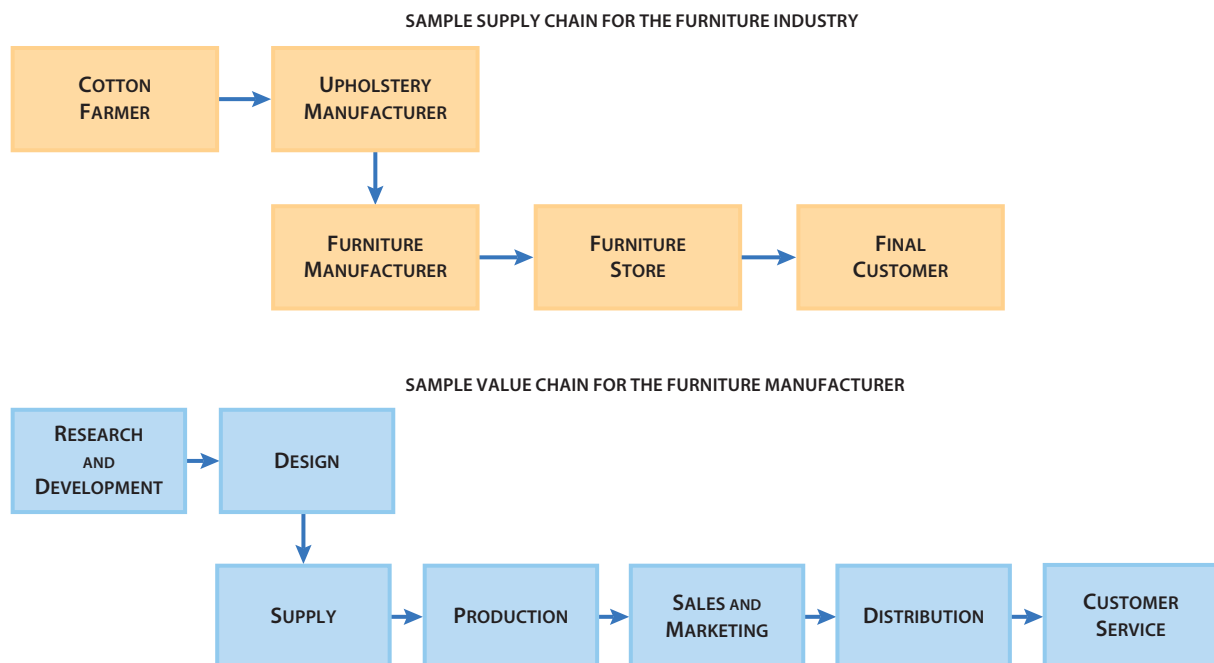
- ▶ Externally, with suppliers and customers, managers will find ways of improving quality, reducing costs, and shortening delivery time.
- ▶ Internally, managers will find the best ways of using resources to create and maintain the value of their products or services. This requires matching resources to the operating activities that add value to a product or service. Managers will examine all business activities involved in value creation for waste, including research and development, design, supply, production, storage, sales and marketing, distribution, and customer service.

Value Chains and Supply Chains

As we noted earlier in the text, a **value chain** is a sequence of activities inside the organization, also known as *primary processes*, that add value to a company's product or service; the value chain also includes support services, such as management accounting, that facilitate the primary processes. Managers see their organization's internal value chain as part of a larger system that includes the value chains of suppliers and customers. This larger system is the **supply chain**—the path that leads from the suppliers of the materials from which a product is made to the final customer. The supply chain (also called the *supply network*) includes both suppliers and suppliers' suppliers, and customers and customers' customers. It links businesses together in a relationship chain of business to business to business.

As Figure 5-1 shows, in the supply chain for a furniture company like La-Z-Boy, a cotton farmer supplies cotton to the upholstery manufacturer, which supplies upholstery to the furniture manufacturer. The furniture manufacturer supplies furniture to furniture stores, which in turn supply furniture to the final

FIGURE 5-1 The Supply Chain and Value Chain in a Furniture Company



customers. Each organization in this supply chain is a customer of an earlier supplier, and each has its own value chain.

The sequence of primary processes in the value chain varies from company to company depending on a number of factors, including the size of the company and the types of products or services that it sells. Figure 5-1 also shows the primary processes that add value for a furniture manufacturer—research and development, design, supply, production, sales and marketing, distribution, and customer service.

Understanding value chains and supply chains gives managers a better grasp of their company's internal and external operations. Managers who understand the supply chain and how their company's value-adding activities fit into their suppliers' and customers' value chains can see their company's role in the overall process of creating and delivering products or services. When organizations work cooperatively with others in their supply chain, they can develop new processes that reduce the total costs of their products or services.

For example, La-Z-Boy, places computers for online order entry in its sofa kiosks located in indoor shopping malls. The computers streamline the processing of orders and make the orders more accurate. In this case, even though La-Z-Boy incurs the cost of the computers, the total cost of making and delivering furniture decreases because the cost of order processing decreases.

Process Value Analysis

Process value analysis (PVA) is a technique that managers use to identify and link all the activities involved in the value chain. It analyzes business processes by relating activities to the events that prompt those activities and to the resources that the activities consume. PVA forces managers to look critically at all phases of their operations. PVA improves cost traceability and results in significantly more accurate product costs, which in turn improves management decisions and increases profitability. By using PVA to identify non-value-adding activities, companies can reduce their costs and redirect their resources to value-adding activities.



FOCUS ON BUSINESS PRACTICE

What Is VBM?

Value-based management (VBM) is a long-term strategy that many businesses use to reward managers who create and sustain shareholder wealth and value. In other words, VBM encourages managers to think like business owners. Three elements are essential for a successful VBM program. First, VBM must have the full support of top management.

Second, performance and compensation must be linked, because “what gets measured and rewarded gets done.” Finally, everyone involved must understand the what, why, and how of the program. Since a variety of VBM approaches exist, each company can tailor its VBM performance metrics and implementation strategy to meet its particular needs.¹

Study Note

The customer's perspective governs whether an activity adds value to a product or service. To minimize costs, managers continuously seek to improve processes and activities. To manage the cost of an activity, they can reduce the activity's frequency or eliminate it entirely.

Value-Adding and Non-Value-Adding Activities

A **value-adding activity** is one that adds value to a product or service as perceived by the customer. In other words, if customers are willing to pay for the activity, it adds value to the product or service. Examples include designing the components of a new recliner, assembling the recliner, and upholstering it.

A **non-value-adding activity** is one that adds cost to a product or service but does not increase its market value. Managers eliminate non-value-adding activities that are not essential to an organization and reduce the costs of those that are essential, such as legal services, management accounting, machine repair, materials handling, and building maintenance. For example, inspection costs can be reduced if an inspector samples one of every three reclining mechanisms received from a supplier rather than inspecting every mechanism. If the supplier is a reliable source of high-quality mechanisms, such a reduction in inspection activity is appropriate.

Another way managers can reduce costs is to outsource an activity—that is, to have it done by another company that is more competent at the work and can perform it at a lower cost. For example, many companies outsource purchasing, accounting, and the maintenance of their information systems. Some activities can be eliminated completely if business processes are changed.

Value-Based Systems

In this chapter, we explore two types of value-based systems—activity-based management (ABM) and lean operations. Both can be used together or separately to eliminate waste and manage activities.

Study Note

ABM and lean operations focus on value-adding activities—not costs—to increase income.

- ▶ They create opportunities to improve the nonfinancial performance measures as well as cost information supplied to managers.
- ▶ They help managers view their organization as a collection of activities. Value-based cost information helps managers improve operating processes and make better pricing decisions.

Activity-Based Management

As you may recall from an earlier chapter, **activity-based management (ABM)** is an approach to managing an organization that identifies all major operating activities, determines the resources consumed by each activity and the cause of the resource usage, and categorizes the activities as either adding value to a product or service or not adding value. ABM focuses on reducing or eliminating non-value-adding activities.

- ▶ Because it provides financial and performance information at the activity level, ABM is useful both for strategic planning and for making tactical and operational decisions about business segments, such as product lines, market segments, and customers.
- ▶ It also helps managers eliminate waste and inefficiencies and redirect resources to activities that add value to the product or service.

Activity-based costing (ABC) is the tool used in an ABM environment to assign activity costs to cost objects. ABC helps managers make better pricing decisions, inventory valuations, and profitability decisions.

Managing Lean Operations

A **lean operation** focuses on eliminating waste in an organization. In other words, business processes should focus on what a customer is willing to pay for. Lean operations emphasize the elimination of three kinds of waste:

- ▶ Waste that can be eliminated proactively through good planning and design of the product or service and the production processes for making it.
- ▶ Waste that can be eliminated during production by smart production scheduling and consistently following standardized product and processing plans to ensure quality.
- ▶ Waste that can be eliminated by management analysis of the actions of workers and machines in the process of making products and services.

Just-in-time (JIT) is one of the key strategies of a lean operation to reorganize production activities and manage inventory. JIT will be discussed later in the chapter.

STOP & APPLY >

The reports that follow are from a furniture store. Which report would be used for financial purposes, and which would be used for activity-based decision making? Why?

Salaries/Commissions	\$1,400	Enter sales orders	\$1,000
Equipment	1,200	Attend sales training	1,000
Office Supplies	300	Create ad campaign	1,500
Rent	1,000	Maintain website	500
Insurance	<u>1,000</u>	Resolve problems	<u>900</u>
Total	<u>\$4,900</u>	Total	<u>\$4,900</u>

SOLUTION

The report on the left is the financial report because it is organized by costs. The report on the right is the ABM report because it is organized by activities or tasks. Thus, the ABM report enables managers to focus on reducing non-value-adding activities.

Activity-Based Costing

LO2 Define *activity-based costing*, and explain how a cost hierarchy and a bill of activities are used.

As access to value chain data has improved, managers have refined the issue of how to assign costs fairly to products or services to determine unit costs. You may recall from an earlier chapter that traditional methods of allocating overhead costs to products use such cost drivers as direct labor hours, direct labor costs, or machine hours and one overhead rate. More than 20 years ago, organizations began realizing that these methods did not assign overhead costs to their product lines accurately and that the resulting inaccuracy in product unit costs was causing poor pricing decisions and poor control of overhead costs. In their search for more accurate product costing, many organizations embraced activity-based costing.

Study Note

ABC can be used to allocate all the various costs that make up overhead and nonmanufacturing activity costs as well.

Study Note

ABC reflects the cause-and-effect relationships between costs and individual processes, products, services, or customers.

As we noted earlier, activity-based costing (ABC) is a tool of ABM. It is a method of assigning costs that calculates a more accurate product cost than traditional methods. It does so by categorizing all indirect costs by activity, tracing the indirect costs to those activities, and assigning those costs to products or services using a cost driver related to the cause of the cost.

Activity-based costing is an important tool of activity-based management because it improves the accuracy in allocating activity-driven costs to cost objects (i.e., products or services). To implement activity-based costing, managers:

1. Identify and classify each activity.
2. Estimate the cost of resources for each activity.
3. Identify a cost driver for each activity and estimate the quantity of each cost driver.
4. Calculate an activity cost rate for each activity.
5. Assign costs to cost objects based on the level of activity required to make the product or provide the service.

While ABC does increase the accuracy of cost information and gives managers greater control over the costs they manage, it does have its limitations, including the following:

- ▶ High measurement costs necessary to collect accurate data from many activities instead of just one overhead account may make ABC too costly.
- ▶ Some costs are difficult to assign to a specific activity or cost object since they benefit the business in general (e.g., the president's salary) and should not be arbitrarily allocated.
- ▶ ABC allocations may add undue complexity and complications to controlling costs.

The Cost Hierarchy and the Bill of Activities

Two tools used in implementing ABC are a cost hierarchy and a bill of activities.

Cost Hierarchy A **cost hierarchy** is a framework for classifying activities according to the level at which their costs are incurred. Many companies use this framework to allocate activity-based costs to products or services. In a manufacturing company, the cost hierarchy typically has four levels: the unit level, the batch level, the product level, and the facility level.

- ▶ **Unit-level activities** are performed each time a unit is produced and are generally considered variable costs. For example, when a furniture manufacturer like **La-Z-Boy** installs a recliner mechanism in a chair, unit-level activities include the direct material cost of the recliner mechanism and direct labor connecting the mechanism to the chair frame. Because each chair contains only one mechanism, these activities have a direct correlation to the number of chairs produced.
- ▶ **Batch-level activities** are performed each time a batch or production run of goods is produced. Examples of batch-level activities include setup and materials handling for the production run of a certain style of recliner. These activities vary with the number of batches prepared or production runs completed.

TABLE 5-1
Sample Activities in Cost Hierarchies


Activity Level	Furniture Manufacturer: Recliner Mechanism Installation
Unit level	Install mechanism Test mechanism
Batch level	Set up installation process Move mechanisms Inspect mechanisms
Product level	Redesign installation process
Facility level	Provide facility maintenance, lighting, and security

- ▶ **Product-level activities** are performed to support a particular product line. Examples of product-level activities include implementing design, engineering, or marketing changes for a particular brand of product. These activities vary with the number of brands or product designs a company has.
- ▶ **Facility-level activities** are performed to support a facility’s general manufacturing process and are generally fixed costs. Examples for a furniture manufacturer include maintaining, lighting, securing, and insuring the factory. These activities are generally a fixed amount for a certain time period.

Note that the frequency of activities varies across levels and that the cost hierarchy includes both value-adding and non-value-adding activities. Service organizations can also use a cost hierarchy to group their activities; the four levels typically are the unit level, the batch level, the service level, and the operations level. Table 5-1 lists examples of activities in the cost hierarchies of a manufacturing company like La-Z-Boy.

Study Note
A bill of activities summarizes costs relating to a product or service and supports the calculation of the product or service unit cost.

Bill of Activities Once managers have created the cost hierarchy, they group the activities into the specified levels and prepare a summary of the activity costs assigned to the selected cost objects. A **bill of activities** is a list of activities and related costs that is used to compute the costs assigned to activities and the product unit cost. More complex bills of activities group activities into activity pools and include activity cost rates and the cost driver levels used to assign costs to cost objects. A bill of activities may be used as the primary document or as a supporting schedule to calculate the product unit cost in both job order and process costing systems and in both manufacturing and service businesses.



STOP

& APPLY >

Furniture Corporation has received an order for 10 recliner chairs from FurnitureTown, LLC. A partially complete bill of activities for that order appears on the next page. Fill in the missing data.

(continued)

Bill of Activities for FurnitureTown, LLC, Order

Activity	Activity Cost Rate	Cost Driver Level	Activity Cost
Unit level			
Parts production	\$50 per machine hour	5 machine hours	\$?
Assembly	\$30 per direct labor hour	10 direct labor hours	?
Packing	\$35 per unit	10 units	?
Batch level			
Work setup	\$25 per setup	4 setups	?
Product level			
Product design	\$160 per design hour	20 design hours	?
Facility level			
Building occupancy	200% of assembly labor cost	?	?
Total activity costs assigned to job			<u>\$?</u>
Total job units			<u>÷ 0</u>
Activity costs per unit (total activity costs ÷ total units)			<u><u>\$?</u></u>
Job cost summary:			
Direct materials			\$1,000
Purchased parts			500
Activity costs			?
Total cost of order			<u>\$?</u>
Product unit cost (total cost ÷ 10 units)			<u><u>\$?</u></u>

SOLUTION

Bill of Activities for FurnitureTown, LLC Order

Activity	Activity Cost Rate	Cost Driver Level	Activity Cost
Unit level			
Parts production	\$50 per machine hour	5 machine hours	\$ 250
Assembly	\$30 per direct labor hour	10 direct labor hours	300
Packing	\$35 per unit	10 units	350
Batch level			
Work setup	\$25 per setup	4 setups	100
Product level			
Product design	\$160 per design hour	2 design hours	320
Facility level			
Building occupancy	200% of assembly labor cost	\$300	<u>600</u>
Total activity costs assigned to job			<u>\$1,920</u>
Total job units			<u>÷ 10</u>
Activity costs per unit (total activity costs ÷ total units)			<u><u>\$ 192</u></u>
Job cost summary:			
Direct materials			\$1,000
Purchased parts			500
Activity costs			1,920
Total cost of order			<u>\$3,420</u>
Product unit cost (total cost ÷ 10 units)			<u><u>\$ 342</u></u>

The New Operating Environment and Lean Operations

LO3 Define the elements of a lean operation, and identify the changes in inventory management that result when a firm adopts its just-in-time operating philosophy.

To achieve lean operations, managers focus on the elimination of waste. They must redesign their company's operating systems, plant layout, and basic management methods to conform to several basic concepts:

- ▶ Simple is better.
- ▶ The quality of the product or service is critical to customer satisfaction.
- ▶ The work environment must emphasize continuous improvement.
- ▶ Maintaining large inventories wastes resources and may hide poor work.
- ▶ Activities or functions that do not add value to a product or service should be eliminated or reduced.
- ▶ Goods should be produced only when needed.
- ▶ Workers must be multiskilled and must participate in eliminating waste.
- ▶ Building and maintaining long-term relationships with suppliers is important.

Application of these elements creates a lean operation throughout the company's value chain and guides all employees' work. Piecemeal attempts at lean operations have proved disastrous when the implementation focused on a few lean tools and methodologies instead of emphasizing how to think lean throughout the organization.

Just-in-Time (JIT)

Traditionally, companies operated with large amounts of inventory. They stored finished goods in anticipation of customers' orders; purchased materials infrequently but in large amounts; had long production runs with infrequent setups; manufactured large batches of products; and trained each member of their work forces to perform a limited number of tasks. Managers determined that changes in how inventory was processed were necessary because

- ▶ Large amounts of an organization's space and money were tied up in inventory.
- ▶ The source of poor-quality materials, products, or services was hard to pinpoint.

Study Note

Traditional environments emphasize *functional* departments that tend to group similar activities together (e.g., repairs and maintenance).



FOCUS ON BUSINESS PRACTICE

The Evolution to Lean Operations

- ▶ Eli Whitney perfected the concept of interchangeable parts in 1799, when he produced 10,000 muskets for the U.S. Army for the low price of \$13.40 per musket.
- ▶ In the late 1890s, Frederick W. Taylor used his ideas of scientific management to standardize work through time studies.
- ▶ In the early twentieth century, Frank and Lillian Galbraith (parents of the authors of *Cheaper by the Dozen*) focused on eliminating waste by studying worker motivation and using motion studies and process charting.
- ▶ Starting in 1910, Henry Ford and Charles E. Sorensen arranged all the elements of manufacturing into a continuous system called the *production line*.
- ▶ After World War II, Taichii Ohno and Shigeo Shingo recognized the importance of inventory management, and they perfected the Toyota production system, from which lean production developed.²

- ▶ The number of non-value-adding activities was growing.
- ▶ Accounting for the manufacturing process was becoming ever more complex.

A lean operation embraces the **just-in-time (JIT) operating philosophy**, which requires that all resources—materials, personnel, and facilities—be acquired and used only as needed to create value for customers. A JIT environment reveals waste and eliminates it by adhering to the principles described below.

Minimum Inventory Levels In the traditional manufacturing environment, parts, materials, and supplies are purchased far in advance and stored until the production department needs them. In contrast, in a JIT environment, materials and parts are purchased and received only when they are needed. The JIT approach lowers costs by reducing the space needed for inventory storage, the amount of materials handling, and the amount of inventory obsolescence. It also reduces the need for inventory control facilities, personnel, and recordkeeping. In addition, it significantly decreases the amount of work in process inventory and the amount of working capital tied up in all inventories.

Study Note

Pull-through production represents a change in concept. Instead of producing goods in anticipation of customers' needs, customers' orders trigger the production process.

Pull-Through Production The JIT operating philosophy requires **pull-through production**, a system in which a customer's order triggers the purchase of materials and the scheduling of production for the products that have been ordered. In contrast, with the **push-through method** used in traditional manufacturing operations, products are manufactured in long production runs and stored in anticipation of customers' orders. With pull-through production, the size of a customer's order determines the size of a production run, and the company purchases materials and parts as needed. Inventory levels are kept low, but machines must be set up more frequently as different jobs are worked on.

Study Note

In the JIT environment, normal operating activities—setup, production, and maintenance—still take place. But the timing of those activities is altered to promote smoother operations and to minimize downtime.

Quick Setup and Flexible Work Cells In the past, managers felt that it was more cost-effective to produce large batches of goods because producing small batches increases the number of machine setups. The success of JIT disproved this. By placing machines in more efficient locations and standardizing setups, setup time can be minimized.

In a traditional factory layout, similar machines are grouped together, forming functional departments. Products are routed through these departments in sequence, so that all necessary operations are completed in order. This process can take several days or weeks, depending on the size and complexity of the job. By changing the factory layout so that all the machines needed for sequential processing are placed together, the JIT operating philosophy may cut the manufacturing time of a product from days to hours, or from weeks to days. The new cluster of machinery forms a flexible **work cell**, an autonomous production line that can perform all required operations efficiently and continuously. The flexible work cell handles a "family of products"—that is, products of similar shape or size. Product families require minimal setup changes as workers move from one job to the next. The more flexible the work cell is, the greater its potential to minimize total production time.

A Multiskilled Work Force In the flexible work cells of a JIT environment, one worker may be required to operate several types of machines simultaneously. The worker may have to set up and retool the machines and even perform routine maintenance on them. A JIT operating philosophy thus requires a multiskilled work force, and multiskilled workers have been very effective in contributing to high levels of productivity.

Study Note

That inspections are necessary is an admission that problems with quality do occur. Continuous inspection throughout production as opposed to inspection only at the end creates awareness of a problem at the point where it occurs.

Study Note

Although separate inspection costs are reduced in a JIT operating environment, some additional time is added to production because the machine operator is now performing the inspection function. The objectives are to reduce *total* costs and to increase quality.

Study Note

The JIT operating philosophy must be adopted by everyone in a company before its total benefits can be realized.

High Levels of Product Quality A JIT environment results in high-quality products because high-quality direct materials are used and inspections are made throughout the production process. In a JIT environment, inspection as a separate step does not add value to a product, so inspection is incorporated into ongoing operations. A JIT machine operator inspects the products as they pass through the manufacturing process. If the operator detects a flaw, he or she shuts down the work cell to prevent the production of similarly flawed products while the cause of the problem is being determined. The operator either fixes the problem or helps others find a way to correct it. This integrated inspection procedure, combined with high-quality materials, produces high-quality finished goods.

Effective Preventive Maintenance When a company rearranges its machinery into flexible work cells, each machine becomes an integral part of its cell. If one machine breaks down, the entire work cell stops functioning, and the product cannot easily be routed to another machine while the malfunctioning machine is being repaired. Continuous JIT operations therefore require an effective system of preventive maintenance. Preventing machine breakdowns is considered more important and more cost-effective than keeping machines running continuously. Machine operators are trained to perform minor repairs when they detect problems. Machines are serviced regularly—much as an automobile is—to help guarantee continued operation. The machine operator conducts routine maintenance during periods of downtime between orders. (Remember that in a JIT setting, the work cell does not operate unless there is a customer order for the product. Machine operators take advantage of such downtime to perform routine maintenance.)

Continuous Improvement of the Work Environment

A JIT operating philosophy fosters loyalty among workers, who are likely to see themselves as part of a team because they are so deeply involved in the production process. Machine operators must have the skills to run several types of machines, detect defective products, suggest measures to correct problems, and maintain the machinery within their work cells. In addition, each worker is encouraged to suggest improvements to the production process. In Japanese, this is called *kaizen*, meaning “good change.” Companies with a JIT operating philosophy receive thousands of employee suggestions and implement a high percentage of them, and they reward workers for suggestions that improve the process. Such an environment fosters workers’ initiative and benefits the company.

Accounting for Product Costs in a JIT Operating Environment

When a firm shifts to lean operations and adopts a JIT operating philosophy, managers must take a new approach to evaluating costs and controlling operations. The changes in the operations will affect how costs are determined and what measures are used to monitor performance.

When a company adopts a JIT operating philosophy, the work cells and the goal of reducing or eliminating non-value-adding activities change the way costs are classified and assigned.

Classifying Costs The traditional production process can be divided into five time frames:

- Processing time** The actual amount of time spent working on a product
- Inspection time** The time spent looking for product flaws or reworking defective units

Moving time	The time spent moving a product from one operation or department to another
Queue time	The time a product spends waiting to be worked on once it arrives at the next operation or department
Storage time	The time a product spends in materials inventory, work in process inventory, or finished goods inventory

In product costing under JIT, costs associated with processing time are classified as either direct materials costs or conversion costs. **Conversion costs** are the sum of the direct labor costs and overhead costs incurred by a production department, work cell, or other work center. According to JIT, costs associated with inspection, moving, queue, and storage time should be reduced or eliminated because they do not add value to the product.

Assigning Costs In a JIT operating environment, managers focus on **throughput time**, the time it takes to move a product through the entire production process. Measures of product movement, such as machine time, are used to apply conversion costs to products.

Sophisticated computer monitoring of the work cells allows many costs to be traced directly to the cells in which products are manufactured. As Table 5-2 shows, several costs that in a traditional environment are treated as indirect costs and applied to products using an overhead rate are treated as the direct costs of a JIT work cell. Because the products that a work cell manufactures are similar in nature, direct materials and conversion costs should be nearly uniform for each product in a cell.

- ▶ The costs of repairs and maintenance, materials handling, operating supplies, utilities, and supervision can be traced directly to work cells as they are incurred.
- ▶ Depreciation charges are based on units of output, not on time, so depreciation can be charged directly to work cells based on the number of units produced.
- ▶ Building occupancy costs, insurance premiums, and property taxes remain indirect costs and must be assigned to the work cells for inclusion in the conversion cost.

TABLE 5-2
Direct and Indirect Costs in Traditional and JIT Environments

	Costs in a Traditional Environment	Costs in a JIT Environment
Direct materials	Direct	Direct
Direct labor	Direct	Direct
Repairs and maintenance	Indirect	Direct to work cell
Materials handling	Indirect	Direct to work cell
Operating supplies	Indirect	Direct to work cell
Utilities costs	Indirect	Direct to work cell
Supervision	Indirect	Direct to work cell
Depreciation	Indirect	Direct to work cell
Supporting service functions	Indirect	Mostly direct to work cell
Building occupancy	Indirect	Indirect
Insurance and taxes	Indirect	Indirect

STOP & APPLY >

The cost categories in the following list are typical of a furniture manufacturer. Identify each cost as direct or indirect, assuming that it was incurred in (1) a traditional manufacturing setting and (2) a JIT environment. State the reasons for changes in classification.

	Traditional Setting	JIT Setting	Reason for Change
Direct materials			
Direct labor			
Supervisory salaries			
Electrical power			
Operating supplies			
Purchased parts			
Employee benefits			
Indirect labor			
Insurance and taxes, plant			

SOLUTION

	Traditional Setting	JIT Setting	Reason for Change
Direct materials	Direct	Direct	
Direct labor	Direct	Direct	
Supervisory salaries	Indirect	Direct	Traceable to work cell
Electrical power	Indirect	Direct	Traceable to work cell
Operating supplies	Indirect	Direct	Traceable to work cell
Purchased parts	Direct	Direct	
Employee benefits	Indirect	Direct	Traceable to work cell
Indirect labor	Indirect	Direct	Traceable to work cell
Insurance and taxes, plant	Indirect	Indirect	

Backflush Costing

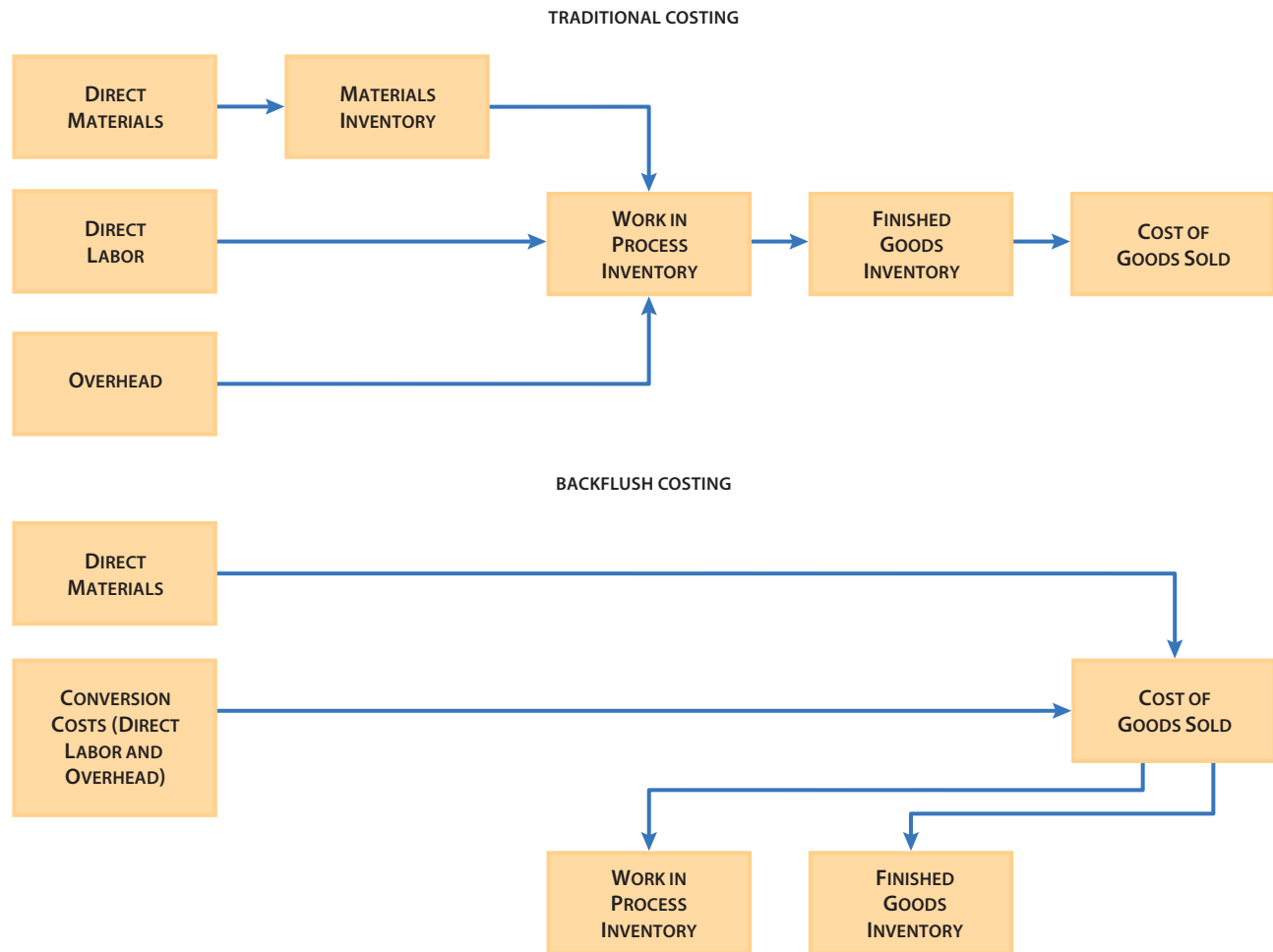
LO4 Define and apply *backflush costing*, and compare the cost flows in traditional and backflush costing.

Study Note

Backflush costing eliminates the need to make journal entries during the period to track cost flows through the production process as the product is made.

Managers in a lean operating environment are continuously seeking ways of reducing wasted resources and wasted time. So far, we have focused on how they can trim waste from operations, but they can reduce waste in other areas as well, including the accounting process. Because a lean operation reduces labor costs, the accounting system can combine the costs of direct labor and overhead into the single category of conversion costs, and because in JIT, materials arrive just in time to be used in the production process, there is little reason to maintain a separate Materials Inventory account. Thus, by simplifying cost flows through the accounting records, it is possible to reduce the time it takes to record and account for the costs of the manufacturing process.

A lean organization can also streamline its accounting process by using backflush costing. In **backflush costing**, all product costs are first accumulated in the Cost of Goods Sold account; at the end of the accounting period, they are “flushed back,” or worked backward, into the appropriate inventory accounts. By having all product costs flow straight to a final destination and working back to determine the proper balances for the inventory accounts at the end of the period, this method saves recording time. As illustrated in Figure 5-2, it eliminates the need to record several transactions that must be recorded in traditional operating environments.

FIGURE 5-2 Comparison of Cost Flows in Traditional and Backflush Costing

In a traditional environment, costs are tracked through the various production departments as products or services move through the production process.

Traditional costing methods:

- ▶ When direct materials arrive at a factory, their costs flow into the Materials Inventory account.
- ▶ When the direct materials are requisitioned into production, their costs flow into the Work in Process Inventory account. When direct labor is used, its costs are added to the Work in Process Inventory account. Overhead is applied to production using a base like direct labor hours, machine hours, or number of units produced and is added to the other costs in the Work in Process Inventory account.
- ▶ At the end of the manufacturing process, the costs of the finished units are transferred to the Finished Goods Inventory account, and when the units are sold, their costs are transferred to the Cost of Goods Sold account.

JIT costing method:

- ▶ In a JIT setting, direct materials arrive just in time to be placed into production. As you can see in Figure 5-2, when backflush costing is used, the direct materials costs and the conversion costs (direct labor and overhead) are immediately charged to the Cost of Goods Sold account.

Study Note

In backflush costing, entries to the Work in Process Inventory and Finished Goods Inventory accounts are made at the end of the period.

- ▶ At the end of the period, the costs of goods in work in process inventory and in finished goods inventory are determined, and those costs are flushed back to the Work in Process Inventory account and the Finished Goods Inventory account. Once those costs have been flushed back, the Cost of Goods Sold account contains only the costs of units completed and sold during the period.

To illustrate, assume that the following transactions occurred at one of **La-Z-Boy's** factories last month:

1. Purchased \$20,000 of direct materials on account.
2. Used all of the direct materials in production during the month.
3. Incurred direct labor costs of \$8,000.
4. Applied \$24,000 of overhead to production.
5. Completed units costing \$51,600 during the month.
6. Sold units costing \$51,500 during the month.

- ▶ **Traditional costing methods:** The top diagram in Figure 5-3 shows how these transactions would be entered in T accounts when traditional product costing is used. You can trace the flow of each cost by following its transaction number.

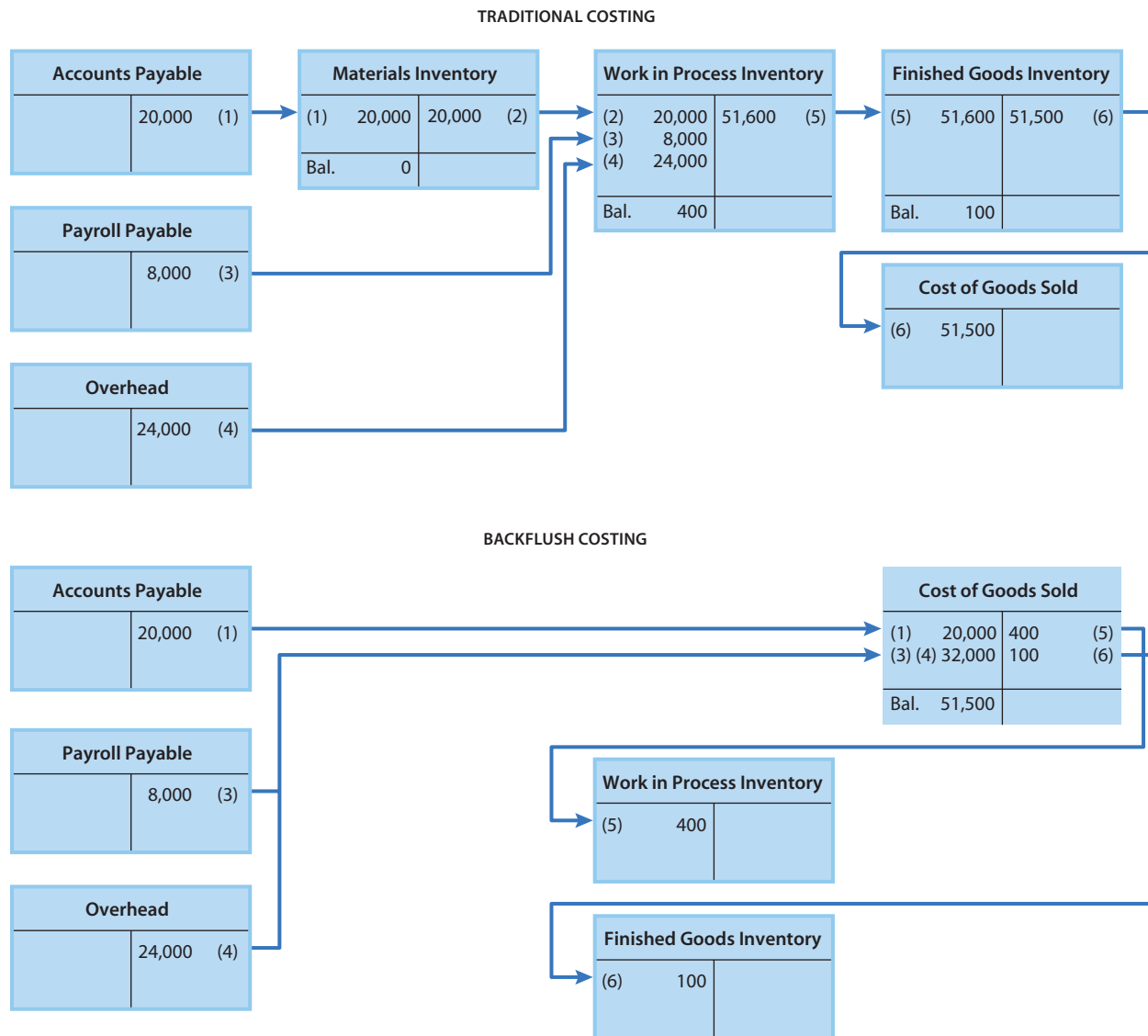
- ▶ **JIT costing method:** The bottom diagram in Figure 5-3 shows how backflush costing in a JIT environment would treat the same transactions. The cost of direct materials (Transaction 1) is charged directly to the Cost of Goods Sold account. Transaction 2, which is included in the traditional method, is not included when backflush costing is used because there is no Materials Inventory account. The costs of direct labor (Transaction 3) and overhead (Transaction 4) are combined and transferred to the Cost of Goods Sold account. The total in the Cost of Goods Sold account is then \$52,000 (\$20,000 for direct materials and \$32,000 for conversion costs).

Once all product costs for the period have been entered in the Cost of Goods Sold account, the amounts to be transferred back to the inventory accounts are calculated.

- ▶ The amount transferred to the Finished Goods Inventory account is the difference between the cost of units sold (Transaction 6) and the cost of completed units (Transaction 5) ($\$51,600 - \$51,500 = \$100$).
- ▶ The remaining difference in the Cost of Goods Sold account represents the cost of the work that is still in production at the end of the period. It is the amount charged to the Cost of Goods Sold account during the period less the actual cost of goods finished during the period (Transaction 5) [$(\$20,000 + \$8,000 + \$24,000) - \$51,600 = \$400$]; this amount is transferred to the Work in Process Inventory account.

Notice that the ending balance in the Cost of Goods Sold account, \$51,500, is the same as the ending balance when traditional costing is used. The difference is that backflush costing enabled us to use fewer accounts and to avoid recording several transactions.

FIGURE 5-3 Cost Flows Through T Accounts in Traditional and Backflush Costing



STOP & APPLY >

For work done during August, Plush Furniture Company, incurred direct materials costs of \$123,450 and conversion costs of \$265,200. The company employs a just-in-time operating environment and backflush costing.

At the end of August, it was determined that the Work in Process Inventory account had been assigned \$980 of costs, and the ending balance of the Finished Goods Inventory account was \$1,290. There were no beginning inventory balances. How much was charged to the Cost of Goods Sold account during August? What was the ending balance of the Cost of Goods Sold account?

SOLUTION

A total of \$388,650 (\$123,450 + \$265,200) was charged to the Cost of Goods Sold account during August. The ending balance of Cost of Goods Sold was \$386,380 (\$388,650 – \$980 – \$1,290).

Comparison of ABM and Lean

LO5 Compare ABM and lean operations as value-based systems.

Study Note

ABM's primary goal is to calculate product or service cost accurately. Lean's primary goal is to eliminate waste in business processes.

ABM and lean have several things in common. As value-based systems, both analyze processes and identify value-adding and non-value-adding activities. Both seek to eliminate waste and reduce non-value-adding activities to improve product or service quality, reduce costs, and improve an organization's efficiency and productivity. Both improve the quality of the information that managers use to make decisions about bidding, pricing, product lines, and outsourcing. However, the two systems differ in their methods of costing and cost assignment.

ABM's tool, ABC, calculates product or service cost by using cost drivers to assign the indirect costs of production to cost objects. ABC is often a fairly complex accounting method used with job order and process costing systems. Note that the ABC method can also be used to examine non-production-related activities, such as marketing and shipping.

Lean uses JIT and reorganizes many activities so that they are performed within work cells. The costs of those activities become direct costs of the work cell and of the products made in that cell. The total production costs within the cell can then be assigned by using simple cost drivers, such as process hours or direct materials cost. Companies that have implemented lean operations may use backflush costing rather than job order costing or process costing. This approach focuses on the output at the end of the production process and simplifies the accounting system. Table 5-3 summarizes the characteristics of ABM and lean.

A company can use both ABM and lean. ABM and ABC will improve the accuracy of the company's product or service costing and help it reduce or eliminate business activities that do not add value for its customers. At the same time, the company can apply lean thinking to simplify processes, use resources effectively, and eliminate waste.

TABLE 5-3 Comparison of ABM and Lean Activity-Based Systems

	ABM	Lean
Primary purpose	To eliminate or reduce non-value-adding activities	To eliminate or reduce waste in all aspects of a business, including its processes and products or services
Cost assignment	Uses ABC to assign overhead costs to the product by using appropriate cost drivers	Uses JIT and reorganizes production activities into work cells; overhead costs incurred in the work cell become direct costs of the cell's products
Costing method	Integrates ABC with job order or process costing to calculate product costs	May use backflush costing to calculate product costs
Limitation	ABC can involve costly data collection and complex allocations	Requires management to think differently and use different performance measures

STOP & APPLY >

Couch Potato, Inc., produces futon mattresses. The company recently changed from a traditional production environment to just-in-time work cells. Would you recommend the use of ABM/ABC or backflush costing for tracking product costs? Explain your choice.

SOLUTION

Because the company produces similar products, it lends itself well to backflush costing for the calculation of product costs. A company that makes a variety of products with differing activity choices in a job order setting is better served by the more accurate and more complex procedures of ABM/ABC product costing.

A LOOK BACK AT ► LA-Z-BOY

In this chapter's Decision Point, we asked the following questions:

- How have value-based systems helped **La-Z-Boy, Inc.**, improve its production processes and reduce delivery time?
- How do La-Z-Boy's managers plan to maintain the company's status as the leading manufacturer of upholstered products?

La-Z-Boy's managers use activity-based management (ABM) and a lean operating environment to identify and reduce or eliminate activities that do not add value to the company's products. These systems focus on minimizing waste, reducing costs, and improving profitability. The continuous flow of information that ABM and JIT provide has enabled La-Z-Boy's managers to improve the company's production processes. They are able to adjust their labor needs each week to meet order requirements; to schedule timely deliveries from suppliers, thus maintaining appropriate inventory levels; and to keep track of the company's fleet of delivery trucks.

La-Z-Boy's disciplined monitoring of order, production, and delivery activities gives the company its competitive edge today and in the future. By using ABM and lean thinking, La-Z-Boy has achieved higher productivity than other furniture manufacturers and is able to offer more than 40,000 product variations.³



Review Problem

Activity-Based Costing

LO2

Assume that one of a furniture company's divisions produces more than a dozen styles of sofas and upholstered furniture. The eight-piece modular seating group is the most difficult to produce and the most expensive. The reclining sofa, which is the division's leading seller, is the easiest to produce. The other styles increase in difficulty of production as the number of pieces increases. Stylemaker Stores recently ordered 175 of the six-piece modular seating group. Because the division is considering a shift to activity-based costing, its controller is interested in using this order to compare ABC with traditional costing. Costs directly traceable to the Stylemaker Stores order are as follows:

Direct materials	\$57,290
Purchased parts	\$76,410
Direct labor hours	1,320
Average direct labor pay rate per hour	\$14.00

With the traditional costing approach, the controller applies overhead costs at a rate of 320 percent of direct labor costs.

For activity-based costing of the Stylemaker Stores order, the controller uses the following data:

Activity	Cost Driver	Activity Cost Rate	Activity Usage
Product design	Engineering hours	\$62 per engineering hour	76 engineering hours
Work cell setup	Number of setups	\$90 per setup	16 setups
Parts production	Machine hours	\$38 per machine hour	380 machine hours
Assembly	Assembly labor hours	\$40 per assembly labor hour	500 assembly labor hours
Product simulation	Testing hours	\$90 per testing hour	28 testing hours
Packaging and shipping	Product units	\$26 per unit	175 units
Building occupancy	Direct labor cost	125% of direct labor cost	\$18,480 direct labor cost

Required

1. Use the traditional costing approach to compute the total cost and product unit cost of the Stylemaker Stores order.
2. Using the cost hierarchy for manufacturing companies, classify each activity of the Stylemaker Stores order according to the level at which it occurs.
3. Prepare a bill of activities for the operating costs, and use ABC to compute the total cost and product unit cost.
4. What is the difference between the product unit cost you computed using the traditional approach and the one you computed using ABC? Does the use of ABC guarantee cost reduction for every order?

**Answers to
Review Problem**

1. Traditional costing approach:

Direct materials	\$ 57,290
Purchased parts	76,410
Direct labor	18,480
Overhead (320% of direct labor cost)	59,136
Total cost of order	<u>\$ 211,316</u>
Product unit cost (total costs ÷ 175 units)	<u>\$1,207.52</u>

2. Activities classified by level of the manufacturing cost hierarchy:

Unit level:	Parts production Assembly Packaging and shipping
Batch level:	Work cell setup
Product level:	Product design Product simulation
Facility level:	Building occupancy

3. Bill of activities and total cost and product unit cost computed with ABC:

Bill of Activities Stylemaker Stores Order			
Activity	Activity Cost Rate	Cost Driver Level	Activity Cost
Unit level			
Parts production	\$38 per machine hour	380 machine hours	\$ 14,440
Assembly	\$40 per assembly labor hour	500 assembly labor hours	20,000
Packaging and shipping	\$26 per unit	175 units	4,550
Batch level			
Work cell setup	\$90 per setup	16 setups	1,440
Product level			
Product design	\$62 per engineering hour	76 engineering hours	4,712
Product simulation	\$90 per testing hour	28 testing hours	2,520
Facility level			
Building occupancy	125% of direct labor cost	\$18,480 direct labor cost	23,100
Total activity costs assigned to job			\$ 70,762
Total job units			÷ 175
Activity costs per unit (total activity costs ÷ total units)			<u>\$ 404.35*</u>
Cost summary			
Direct materials			\$ 57,290
Purchased parts			76,410
Activity costs (includes labor and overhead)			70,762
Total cost of order			<u>\$ 204,462</u>
Product unit cost (total cost of order ÷ 175 units)			<u>\$1,168.35*</u>

4. Product unit cost using traditional costing approach:	\$1,207.52
Product unit cost using activity-based costing approach:	<u>1,168.35*</u>
Difference:	<u>\$ 39.17</u>

Although the product unit cost computed using ABC is lower than the one computed using the traditional costing approach, ABC does not guarantee cost reduction for every product. It does improve cost traceability, which often identifies products that are “undercosted” or “overcosted” by a traditional product costing system.

*Rounded.

STOP & REVIEW >

LO1 Explain why managers use value-based systems, and discuss the relationship of these systems to the supply chain and value chain.

A value-based system categorizes activities as either adding value to a product or service or not adding value. It enables managers to see their organization as a collection of value-creating activities (a value chain) that operates as part of a larger system that includes suppliers' and customers' value chains (a supply chain). This perspective helps managers work cooperatively both inside and outside their organizations to reduce costs by eliminating waste and inefficiencies and by redirecting resources toward value-adding activities. PVA is a technique that managers use to identify and link all the activities involved in the value chain. It analyzes business processes by relating activities to the events that prompt the activities and to the resources that the activities consume. A value-adding activity adds value to a product or service as perceived by the customer. A non-value-adding activity adds cost to a product or service but does not increase its market value.

LO2 Define activity-based costing, and explain how a cost hierarchy and a bill of activities are used.

Activity-based costing (ABC) is a method of assigning costs that calculates a more accurate product cost than traditional methods do. It does so by categorizing all indirect costs by activity, tracing the indirect costs to those activities, and assigning those costs to products using a cost driver related to the cause of the cost. To implement ABC, managers (1) identify and classify each activity, (2) estimate the cost of resources for each activity, (3) identify a cost driver for each activity and estimate the quantity of each cost driver, (4) calculate an activity cost rate for each activity, and (5) assign costs to cost objects based on the level of activity required to make the product or provide the service. ABC's primary disadvantage is that it is costly to implement.

Two tools—a cost hierarchy and a bill of activities—help in the implementation of ABC. To create a cost hierarchy, managers classify activities into four levels. Unit-level activities are performed each time a unit is produced. Batch-level activities are performed each time a batch of goods is produced. Product-level activities are performed to support a particular product line or brand. Facility-level activities are performed to support a facility's general manufacturing process. A bill of activities is then used to compute the costs assigned to activities and the product or service unit cost.

LO3 Define the elements of a lean operation, and identify the changes in inventory management that result when a firm adopts its just-in-time operating philosophy.

Lean operation's objective is to eliminate waste. One of its basic principles is to operate production on a just-in-time (JIT) basis. The elements of a JIT environment are minimum inventory levels, pull-through production, quick setup and flexible work cells, a multiskilled work force, high levels of product quality, effective preventive maintenance, and continuous improvement of the work environment.

In product costing under JIT, processing costs are classified as either direct materials costs or conversion costs. The costs associated with inspection time, moving time, queue time, and storage time are reduced or eliminated. With computerized monitoring of the work cells, many costs that are treated as indirect or overhead costs in traditional manufacturing settings become direct costs because they can be traced directly to work cells. The only costs that remain indirect costs and must be assigned to the work cells are those that cannot be linked to a specific work cell—in other words, those associated with building occupancy, insurance, and property taxes.

LO4 Define and apply backflush costing, and compare the cost flows in traditional and backflush costing.

In backflush costing, all product costs are first accumulated in the Cost of Goods Sold account; at the end of the accounting period, they are “flushed back,” or worked backward, into the appropriate inventory accounts. Backflush costing is commonly used to account for product costs in a JIT operating environment. It differs from the traditional costing approach, which records the costs of materials purchased in the Materials Inventory account and uses the Work in Process Inventory account to record the costs of direct materials, direct labor, and overhead during the production process. The objective of backflush costing is to save recording time, which cuts costs.

LO5 Compare ABM and lean operations as value-based systems.

As value-based systems, both ABM and lean seek to eliminate waste and reduce non-value-adding activities. However, they differ in their approaches to cost assignment and calculation of product cost. ABM uses ABC to assign indirect costs to products using cost drivers; lean uses JIT to reorganize activities so that they are performed within work cells, and the overhead costs incurred in a work cell become direct costs of the products made in that cell. ABM uses job order or process costing to calculate product costs, whereas lean may use backflush costing.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Activity-based costing (ABC) 171 (LO1)

Activity-based management (ABM) 171 (LO1)

Backflush costing 180 (LO4)

Batch-level activities 173 (LO2)

Bill of activities 174 (LO2)

Conversion costs 179 (LO3)

Cost hierarchy 173 (LO2)

Facility-level activities 174 (LO2)

Full product cost 168 (LO1)

Inspection time 178 (LO3)

Just-in-time (JIT) operating philosophy 177 (LO3)

Lean operation 172 (LO1)

Moving time 179 (LO3)

Non-value-adding activity 171 (LO1)

Processing time 178 (LO3)

Process value analysis (PVA) 170 (LO1)

Product-level activities 174 (LO2)

Pull-through production 177 (LO3)

Push-through method 177 (LO3)

Queue time 179 (LO3)

Storage time 179 (LO3)

Supply chain 169 (LO1)

Throughput time 179 (LO3)

Unit-level activities 173 (LO2)

Value-adding activity 171 (LO1)

Value-based systems 168 (LO1)

Value chain 169 (LO1)

Work cell 177 (LO3)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Activity-Based Systems

SE 1. Thom Lutz started a retail clothing business two years ago. Lutz's first year was very successful, but sales dropped 50 percent in the second year. A friend who is a business consultant analyzed Lutz's business and came up with two basic reasons for the decline in sales: (1) Lutz has been placing orders late in each season, and (2) shipments of clothing have been arriving late and in poor condition. What measures can Lutz take to improve his business and persuade customers to return?

L01 The Value Chain

SE 2. Which of the following activities would be part of the value chain of a manufacturing company? Which activities do not add value?

- | | |
|----------------------|---------------------------|
| 1. Product marketing | 5. Product packing |
| 2. Machine drilling | 6. Cost accounting |
| 3. Materials storage | 7. Moving work in process |
| 4. Product design | 8. Inventory control |

L01 The Supply Chain

SE 3. Jack DuBois is developing plans to open a restaurant called Ribs 'n Slaw. He has located a building and will lease all the furniture and equipment he needs for the restaurant. Food Servers, Inc. will supply all the restaurant's personnel. Identify the components of Ribs 'n Slaw's supply chain.

L01 Value-Adding and Non-Value-Adding Activities

SE 4. Indicate whether the following activities of a submarine sandwich shop are value-adding (V) or non-value-adding (NV):

- | | |
|------------------------------------|-----------------------------------|
| 1. Purchasing sandwich ingredients | 4. Cleaning up the shop |
| 2. Storing condiments | 5. Making home deliveries |
| 3. Making sandwiches | 6. Accounting for sales and costs |

L02 The Cost Hierarchy

SE 5. Engineering design is an activity that is vital to the success of any motor vehicle manufacturer. Identify the level at which engineering design would be classified in the cost hierarchy used with ABC for each of the following:

1. A maker of unique editions of luxury automobiles
2. A maker of built-to-order city and county emergency vehicles (orders are usually placed for 10 to 12 identical vehicles)
3. A maker of a line of automobiles sold throughout the world

L02 The Cost Hierarchy

SE 6. Match the four levels of the cost hierarchy to the following activities of a blue jeans manufacturer that uses activity-based management:

1. Routine maintenance of sewing machines
2. Designing a pattern for a new style
3. Sewing seams on a garment
4. Producing 100 jeans of a certain style in a certain size

L03 Elements of a JIT Operating Environment

SE 7. Maintaining minimum inventory levels and using pull-through production are important elements of a just-in-time operating environment. How does pull-through production help minimize inventories?

L03 Product Costing Changes in a JIT Environment

SE 8. Aromatherapy Products Company is in the process of adopting the just-in-time operating environment for its lotion-making operations. Indicate which of the following overhead costs are non-value-adding costs (NVA) and which can be traced directly to the new lotion-making work cell (D):

1. Storage containers for work in process inventory
2. Insurance on the storage warehouse
3. Machine electricity
4. Machine repairs
5. Depreciation of the storage container moving equipment
6. Machine setup labor

L04 Backflush Costing

SE 9. For work done during August, Pansey Company incurred direct materials costs of \$120,000 and conversion costs of \$260,000. The company employs a just-in-time operating philosophy and backflush costing. At the end of August, it was determined that the Work in Process Inventory account had been assigned \$900 of costs, and the ending balance of the Finished Goods Inventory account was \$1,300. There were no beginning inventory balances. How much was charged to the Cost of Goods Sold account during August? What was the ending balance of that account?

L05 Comparison of ABM and Lean

SE 10. Hwang Corp. recently installed three just-in-time work cells in its screen-making division. The work cells will make large quantities of similar products for major window and door manufacturers. Should Hwang use lean with JIT and backflush costing or ABM and ABC to account for product costs? Defend your choice of system.

Exercises

L01 Management Reports

E 1. The reports that follow are from a department in an insurance company. Which report would be used for financial purposes, and which would be used for activity-based decision making? Why?

Salaries	\$ 1,400	Enter claims into system	\$ 2,000
Equipment	1,200	Analyze claims	1,000
Travel expenses	8,000	Suspend claims	1,500
Supplies	300	Receive inquiries	1,500
Use and occupancy	3,000	Resolve problems	400
		Process batches	3,000
		Determine eligibility	4,000
		Make copies	200
		Write correspondence	100
		Attend training	200
Total	\$13,900	Total	\$13,900

L01 The Supply Chain and Value Chain

E 2. Indicate which of the following persons and activities associated with a lawn and garden nursery are part of the supply chain (S) and which are part of the value chain (V):

- | | |
|----------------------------------|-------------------------------|
| 1. Plant and tree vendor | 5. Advertising company |
| 2. Purchasing potted trees | 6. Scheduling delivery trucks |
| 3. Computer and software company | 7. Customer service |
| 4. Creating marketing plans | |

L01 The Supply Chain and Value Chain

E 3. The items in the following list are associated with a bank. Indicate which are part of the supply chain (S) and which are part of the value chain (V).

- | | |
|----------------------------|-------------|
| 1. Federal Reserve Bank | 4. ATM |
| 2. Student loan processing | 5. Customer |
| 3. Investment services | |

L01 Value Analysis

E 4. Libbel Enterprises has been in business for 30 years. Last year, the company purchased Chemcraft Laboratory and entered the chemical processing business. Libbel's controller prepared a process value analysis of the new operation and identified the following activities:

New product research	Product sales	Product bottling process
Design testing	Packaging process	Product warranty work
Materials storage	Materials inspection	Product engineering
Product curing	New product	Purchasing of direct
process	marketing	materials
Product scheduling	Product inspection	Finished goods storage
Product spoilage	Product delivery	Cleanup of processing areas
Customer follow-up	Materials delivery	Product mixing process

Identify the value-adding activities in this list, and classify them into the activity areas of the value chain illustrated in Figure 19-1. Prepare a separate list of the non-value-adding activities.

L01 Value-Adding Activities

E 5. When Courtney Tybee prepared a process value analysis for her company, she identified the following primary activities. Identify the value-adding activities (VA) and the non-value-adding activities (NVA).

- | | |
|--------------------------|-----------------------|
| 1. Production scheduling | 5. Engineering design |
| 2. Customer follow-up | 6. Product marketing |
| 3. Materials moving | 7. Product sales |
| 4. Product inspection | 8. Materials storage |

L02 The Cost Hierarchy

E 6. Copia Electronics makes speaker systems. Its customers range from new hotels and restaurants that need specifically designed sound systems to nationwide retail outlets that order large quantities of similar products. The following activities are part of the company's operating process:

New retail product design	Purchasing of materials	Assembly labor
Retail product marketing	Building repair	Assembly line setup
Unique system design	Retail sales commissions	Building security
Unique system packaging	Bulk packing of orders	Facility supervision

Classify each activity as unit level (UL), batch level (BL), product level (PL), or facility level (FL).

L02 Bill of Activities

E7. Lake Corporation has received an order for handheld computers from Union, LLC. A partially complete bill of activities for that order appears below. Fill in the missing data.

Lake Corporation Bill of Activities for Union, LLC Order Form			
Activity	Activity Cost Rate	Cost Driver Level	Activity Cost
Unit level			
Parts production	\$50 per machine hour	200 machine hours	\$?
Assembly	\$20 per direct labor hour	100 direct labor hours	?
Packaging and shipping	\$12.50 per unit	400 units	?
Batch level			
Work cell setup	\$100 per setup	16 setups	?
Product level			
Product design	\$60 per engineering hour	80 engineering hours	?
Product simulation	\$80 per testing hour	30 testing hours	?
Facility level			
Building occupancy	200% of assembly labor cost	?	?
Total activity costs assigned to job			\$?
Total job units			÷ 400
Activity costs per unit (total activity costs ÷ total units)			<u>\$?</u>
Cost summary			
Direct materials			\$60,000
Purchased parts			80,000
Activity costs			?
Total cost of order			<u>\$?</u>
Product unit cost (total cost ÷ 400 units)			<u>\$?</u>

L02 Activity Cost Rates

E8. Compute the activity cost rates for materials handling, assembly, and design based on these data:

Materials	
Cloth	\$26,000
Fasteners	4,000
Purchased parts	40,000
Materials handling	
Labor	8,000
Equipment depreciation	5,000
Electrical power	2,000
Maintenance	6,000
Assembly	
Machine operators	5,000

Design

Labor	\$ 5,000
Electrical power	1,000
Overhead	8,000

Output totaled 40,000 units. Each unit requires three machine hours of effort. Materials handling costs are allocated to the products based on direct materials cost. Design costs are allocated based on units produced. Assembly costs are allocated based on 500 machine operator hours. [**Hint:** Activity cost rate = (Total activity costs ÷ Total allocation base). Examples of an allocation base include total dollars of materials, total machine operator hours, or total units of output.]

L03 Elements of a Lean Operating Environment

E 9. The following numbered items are concepts that underlie value-based systems, such as ABM and lean. Match each concept to the related lettered element(s) of a lean operating environment.

- Business processes are simplified.
- The quality of the product or service is critical.
- Employees are cross-trained.
- Large inventories waste resources and may hide bad work.
- Goods should be produced only when needed.
- Equipment downtime is minimized.
 - Minimum inventory levels
 - Pull-through production
 - Quick machine setups and flexible work cells
 - A multiskilled work force
 - High levels of product quality
 - Effective preventive maintenance

L03 Comparison of Traditional Manufacturing Environments and JIT

E 10. Identify which of the following exist in a traditional manufacturing environment and which exist in a JIT environment:

- Large amounts of inventory
- Complex manufacturing processes
- A multiskilled labor force
- Flexible work cells
- Push-through production methods
- Materials purchased infrequently but in large lot sizes
- Infrequent setups

L03 Direct and Indirect Costs in JIT and Traditional Manufacturing Environments

E 11. The cost categories in this list are typical of many manufacturing operations:

Direct materials:	Direct labor	Depreciation—machinery
Sheet steel	Engineering labor	Supervisory salaries
Iron castings	Indirect labor	Electrical power
Assembly parts:	Operating supplies	Insurance and taxes—plant
Part 24RE6	Small tools	President's salary
Part 15RF8	Depreciation—plant	Employee benefits

Identify each cost as direct or indirect, assuming that it was incurred in (1) a traditional manufacturing setting and (2) a JIT environment. State the reasons for changes in classification.

L04 Backflush Costing

E 12. Conda Products Company implemented a JIT work environment in its trowel division eight months ago, and the division has been operating at near capacity since then. At the beginning of May, Work in Process Inventory and Finished Goods Inventory had zero balances. The following transactions took place last week:

- May 28 Ordered, received, and used handles and sheet metal costing \$11,340.
- 29 Direct labor costs incurred, \$5,400.
- 29 Overhead costs incurred, \$8,100.
- 30 Completed trowels costing \$24,800.
- 31 Sold trowels costing \$24,000.

Using backflush costing, calculate the ending balance in the Work in Process Inventory and Finished Goods Inventory accounts.

L04 Backflush Costing

E 13. Good Morning Enterprises produces digital alarm clocks. It has a just-in-time assembly process and uses backflush costing to record production costs. Overhead is assigned at a rate of \$17 per assembly labor hour. There were no beginning inventories in March. During March, the following operating data were generated:

Cost of direct materials purchased and used	\$53,200
Direct labor costs incurred	\$27,300
Overhead costs assigned	?
Assembly hours worked	3,840 hours
Ending work in process inventory	\$1,050
Ending finished goods inventory	\$960

Using T accounts, show the flow of costs through the backflush costing system. What is the total cost of goods sold in March?

L05 Comparison of ABM and Lean

E 14. Identify each of the following as a characteristic of ABM or lean:

1. Backflush costing
2. ABC used to assign overhead costs to the product cost
3. ABC integrated with job order or process costing systems
4. Complexity reduced by using work cells, minimizing inventories, and reducing or eliminating non-value-adding activities
5. Activities reorganized so that they are performed within work cells

L05 Comparison of ABM and Lean

E 15. The following are excerpts from a conversation between two managers about their companies' activity-based systems. Identify the manager who works for a company that emphasizes ABM and the one who works for a company that emphasizes a lean system.

Manager 1: We try to manage our resources effectively by monitoring operating activities. We analyze all major operating activities, and we focus on reducing or eliminating the ones that don't add value to our products. Our product costs are more accurate since we allocate activity costs to products and services.

Manager 2: We're very concerned with eliminating waste to reduce costs. We've designed our operations in flexible work cells to reduce the time it takes to move, store, queue, and inspect materials. We've also reduced our inventories by buying and using materials only when we need them.

Problems

LO1 The Value Chain and Process Value Analysis

P 1. Lindstrom Industries, Inc. produces chain saws, weed whackers, and lawn mowers for major retail chains. Lindstrom makes these products to order in large quantities for each customer. It has adopted activity-based management, and its controller is in the process of developing an ABC system. The controller has identified the following primary activities of the company:

Product delivery	Production—assembly
Customer follow-up	Engineering design
Materials and parts purchasing	Product inspection
Materials storage	Processing areas cleanup
Materials inspection	Product marketing
Production—drilling	Building maintenance
Product packaging	Product sales
Product research	Product rework
Finished goods storage	Production—grinding
Production—machine setup	Personnel services
Materials moving	Production scheduling

Required

1. Identify the activities that do not add value to Lindstrom’s products.
2. Assist the controller’s analysis by grouping the value-adding activities into the activity areas of the value chain shown in Figure 19-1.
3. State whether each non-value-adding activity is necessary or unnecessary. Suggest how each unnecessary activity could be reduced or eliminated.

Manager insight ►

LO2 Activity-Based Costing

P 2. Boulware Products, Inc. produces printers for wholesale distributors. It has just completed packaging an order from Shawl Company for 450 printers. Before the order is shipped, the controller wants to compare the unit costs computed under the company’s new activity-based costing system with the unit costs computed under its traditional costing system. Boulware’s traditional costing system assigned overhead costs at a rate of 240 percent of direct labor cost.

Data for the Shawl order are as follows: direct materials, \$17,552; purchased parts, \$14,856; direct labor hours, 140; and average direct labor pay rate per hour, \$17.

Data for activity-based costing related to processing direct materials and purchased parts for the Shawl order are as follows:

Activity	Cost Driver	Activity Cost Rate	Activity Usage
Engineering systems design	Engineering hours	\$28 per engineering hour	18 engineering hours
Setup	Number of setups	\$36 per setup	12 setups
Parts production	Machine hours	\$37 per machine hour	82 machine hours
Product assembly	Assembly hours	\$42 per assembly hour	96 assembly hours
Packaging	Number of packages	\$5.60 per package	150 packages
Building occupancy	Machine hours	\$10 per machine hour	82 machine hours

Required

Manager insight ►

1. Use the traditional costing approach to compute the total cost and the product unit cost of the Shawl order.
2. Using the cost hierarchy, identify each activity as unit level, batch level, product level, or facility level.
3. Prepare a bill of activities for the activity costs.
4. Use ABC to compute the total cost and product unit cost of the Shawl order.
5. What is the difference between the product unit cost you computed using the traditional approach and the one you computed using ABC? Does the use of ABC guarantee cost reduction for every order?

L02 Activity Cost Rates

P 3. Noir Company produces four versions of its model J17-21 bicycle seat. The four versions have different shapes, but their processing operations and production costs are identical. During July, these costs were incurred:

Direct materials	
Leather	\$25,430
Metal frame	39,180
Bolts	3,010
Materials handling	
Labor	8,232
Equipment depreciation	4,410
Electrical power	2,460
Maintenance	5,184
Assembly	
Direct labor	13,230
Engineering design	
Labor	4,116
Electrical power	1,176
Engineering overhead	7,644
Overhead	
Equipment depreciation	7,056
Indirect labor	30,870
Supervision	17,640
Operating supplies	4,410
Electrical power	10,584
Repairs and maintenance	21,168
Building occupancy overhead	52,920

July's output totaled 29,400 units. Each unit requires three machine hours of effort. Materials handling costs are allocated to the products based on direct materials cost, engineering design costs are allocated based on units produced, and overhead is allocated based on machine hours. Assembly costs are allocated based on direct labor hours, which are estimated at 882 for July.

During July, Noir Company completed 520 bicycle seats for Job 142. The activity usage for Job 142 was as follows: direct materials, \$1,150; direct labor hours, 15.

Required

1. Compute the following activity cost rates: (a) materials handling cost rate; (b) assembly cost rate, (c) engineering design cost rate, and (d) overhead rate.

2. Prepare a bill of activities for Job 142.
3. Use activity-based costing to compute the job's total cost and product unit cost.

LO3 Direct and Indirect Costs in Lean and Traditional Manufacturing Environments

P4. Funz Company, which produces wooden toys, is about to adopt a lean operating environment. In anticipation of the change, Letty Hernandez, Funz's controller, prepared the following list of costs for December:

Wood	\$1,200	Insurance—plant	\$ 324
Bolts	32	President's salary	4,000
Small tools	54	Engineering labor	2,700
Depreciation—plant	450	Utilities	1,250
Depreciation—machinery	275	Building occupancy	1,740
Direct labor	2,675	Supervision	2,686
Indirect labor	890	Operating supplies	254
Purchased parts	58	Repairs and maintenance	198
Materials handling	74	Employee benefits	2,654

Required

1. Identify each cost as direct or indirect, assuming that it was incurred in a traditional manufacturing setting.
2. Identify each cost as direct or indirect, assuming that it was incurred in a lean environment.
3. Assume that the costs incurred in the lean environment are for a work cell that completed 1,250 toy cars in December. Compute the total direct cost and the direct cost per unit for the cars produced.

LO4 Backflush Costing

P5. Automotive Parts Company produces 12 parts for car bodies and sells them to three automobile assembly companies in the United States. The company implemented lean operating and costing procedures three years ago. Overhead is applied at a rate of \$26 per work cell hour used. All direct materials and purchased parts are used as they are received.

One of the company's work cells produces automobile fenders that are completely detailed and ready to install when received by the customer. The cell is operated by four employees and involves a flexible manufacturing system with 14 workstations. Operating details for February for this cell are as follows:

Beginning work in process inventory	—
Beginning finished goods inventory	\$420
Cost of direct materials purchased on account and used	\$213,400
Cost of parts purchased on account and used	\$111,250
Direct labor costs incurred	\$26,450
Overhead costs assigned	?
Work cell hours used	8,260
Costs of goods completed during February	\$564,650
Ending work in process inventory	\$1,210
Ending finished goods inventory	\$670

Required

1. Using T accounts, show the cost flows through a backflush costing system.
2. Using T accounts, show the cost flows through a traditional costing system.
3. What is the total cost of goods sold for the month?

Alternate Problems

L01 L02 The Value Chain and Process Value Analysis

P 6. Direct Marketing Inc. (DMI) offers database marketing strategies to help companies increase their sales. DMI's basic package of services includes the design of a mailing piece (either a Direct Mailer or a Store Mailer), creation and maintenance of marketing databases containing information about the client's target group, and a production process that prints a promotional piece and prepares it for mailing. In its marketing strategies, DMI targets working women ages 25 to 54 who are married with children and who have an annual household income in excess of \$50,000. DMI has adopted activity-based management, and its controller is in the process of developing an ABC system. The controller has identified the following primary activities of the company:

Use database of customers	Accounting
Service sales	Mailer assembly
Deliver mailers to post office	Process orders
Supplies storage	Purchase supplies
Client follow-up	Design mailer
Database research trends	Building maintenance
Schedule order processing	Processing cleanup
Personnel	Mailer rework

Required

1. Identify the activities that do not add value to DMI's services.
2. Assist the controller's analysis by grouping the value-adding activities into the activity areas of the value chain shown in Figure 19-1.
3. State whether each non-value-adding activity is necessary or unnecessary. Suggest how each unnecessary activity could be reduced or eliminated.

Manager insight ►

L02 Activity-Based Costing

P 7. Kauli Company produces cellular phones. It has just completed an order for 10,000 phones placed by Stay Connect, Ltd. Kauli recently shifted to an activity-based costing system, and its controller is interested in the impact that the ABC system had on the Stay Connect order. Data for that order are as follows: direct materials, \$36,950; purchased parts, \$21,100; direct labor hours, 220; average direct labor pay rate per hour, \$15.

Under Kauli's traditional costing system, overhead costs were assigned at a rate of 270 percent of direct labor cost.

Data for activity-based costing for the Stay Connect order are as follows:

Activity	Cost Driver	Activity Cost Rate	Activity Usage
Electrical engineering design	Engineering hours	\$19 per engineering hour	32 engineering hours
Setup	Number of setups	\$29 per setup	11 setups
Parts production	Machine hours	\$26 per machine hour	134 machine hours
Product testing	Number of tests	\$32 per test	52 tests
Packaging	Number of packages	\$0.0374 per package	10,000 packages
Building occupancy	Machine hours	\$9.80 per machine hour	134 machine hours
Assembly	Direct labor hours	\$15 per direct labor hour	220 direct labor hours

Required

1. Use the traditional costing approach to compute the total cost and the product unit cost of the Stay Connect order.
 2. Using the cost hierarchy, identify each activity as unit level, batch level, product level, or facility level.
 3. Prepare a bill of activities for the activity costs.
 4. Use ABC to compute the total cost and product unit cost of the Stay Connect order.
- Manager insight** ▶ 5. What is the difference between the product unit cost you computed using the traditional approach and the one you computed using ABC? Does the use of ABC guarantee cost reduction for every order?

L02 Activity Cost Rates

P 8. Meanwhile Company produces three models of aluminum skateboards. The models have minor differences, but their processing operations and production costs are identical. During June, these costs were incurred:

Direct materials	
Aluminum frame	\$162,524
Bolts	3,876
Purchased parts	
Wheels	74,934
Decals	5,066
Materials handling (<i>assigned based on direct materials cost</i>)	
Labor	17,068
Utilities	4,438
Maintenance	914
Depreciation	876
Assembly line (<i>assigned based on labor hours</i>)	
Labor	46,080
Setup (<i>assigned based on number of setups</i>)	
Labor	6,385
Supplies	762
Overhead	3,953
Product testing (<i>assigned based on number of tests</i>)	
Labor	2,765
Supplies	435
Building occupancy (<i>assigned based on machine hours</i>)	
Insurance	5,767
Depreciation	2,452
Repairs and maintenance	3,781

For June, output totaled 32,000 skateboards. Each board required 1.5 machine hours of effort. During June, Meanwhile's assembly line worked 2,304 hours, performed 370 setups and 64,000 product tests, and completed an order for 1,000 skateboards placed by Whatever Toys Company. The job incurred costs of \$5,200 for direct materials and \$2,500 for purchased parts. It required 3 setups, 2,000 tests, and 72 assembly line hours.

Required

1. Compute the following activity cost rates:
 - a. Materials handling cost rate
 - b. Assembly line cost rate

- c. Setup cost rate
- d. Product testing cost rate
- e. Building occupancy cost rate
2. Prepare a bill of activities for the Whatever Toys job.
3. Use activity-based costing to compute the job's total cost and product unit cost. (Round your answer to two decimal places.)

L03 Direct and Indirect Costs in Lean and Traditional Manufacturing Environments

P 9. Caffene Company, which processes coffee beans into ground coffee, is about to adopt a lean operating environment. In anticipation of the change, Hattie Peralto, Caffene's controller, prepared the following list of costs for the month:

Coffee beans	\$5,000	Insurance—plant	\$ 300
Bags	100	President's salary	4,000
Small tools	80	Engineering labor	1,700
Depreciation—plant	400	Utilities	1,250
Depreciation—grinder	200	Building occupancy	1,940
Direct labor	1,000	Supervision	400
Indirect labor	300	Operating supplies	205
Labels	20	Repairs and maintenance	120
Materials handling	75	Employee benefits	500

Required

1. Identify each cost as direct or indirect, assuming that it was incurred in a traditional manufacturing setting.
2. Identify each cost as direct or indirect, assuming that it was incurred in a just-in-time (JIT) environment.
3. Assume that the costs incurred in the JIT environment are for a work cell that completed 5,000 1-pound bags of coffee during the month. Compute the total direct cost and the direct cost per unit for the bags produced.

L04 Backflush Costing

P10. Reilly Corporation produces metal fasteners using six work cells, one for each of its product lines. It implemented just-in-time operations and costing methods two years ago. Overhead is assigned using a rate of \$14 per machine hour for the Machine Snap Work Cell. There were no beginning inventories on April 1. All direct materials and purchased parts are used as they are received. Operating details for April for the Machine Snap Work Cell are as follows:

Cost of direct materials purchased on account and used	\$104,500
Cost of parts purchased on account and used	\$78,900
Direct labor costs incurred	\$39,000
Overhead costs assigned	?
Machine hours used	12,220
Costs of goods completed during April	\$392,540
Ending work in process inventory	\$940
Ending finished goods inventory	\$1,020

Required

1. Using T accounts, show the flow of costs through a backflush costing system.
2. Using T accounts, show the flow of costs through a traditional costing system.
3. What is the total cost of goods sold for April using a traditional costing system?

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 LO2 ABM and ABC in a Service Business

C1. MUF, a CPA firm, has provided audit and tax services to businesses in the London area for over 50 years. Recently, the firm decided to use ABM and activity-based costing to assign its overhead costs to those service functions. Gemma Fior, the company's controller, is interested in seeing how the change from the traditional to the activity-based costing approach affects the average cost per audit job. The following information has been provided to assist in the comparison:

Total direct labor costs	£400,000
Other direct costs	<u>120,000</u>
Total direct costs	<u>£520,000</u>

The traditional costing approach assigned overhead costs at a rate of 120 percent of direct labor costs.

Data for activity-based costing of the audit function are as follows:

Activity	Cost Driver	Activity Cost Rate	Activity Usage
Professional development	Number of employees	£2,000 per employee	50 employees
Administration	Number of jobs	£1,000 per job	50 jobs
Client development	Number of new clients	£5,000 per new client	29 new clients

1. Using direct labor cost as the cost driver, calculate the total costs for the audit function. What is the average cost per job?
2. Using activity-based costing to assign overhead, calculate the total costs for the audit function. What is the average cost per job?
3. Calculate the difference in total costs between the two approaches. Why would activity-based costing be the better approach for assigning overhead to the audit function?
4. Your instructor will divide the class into groups to work through the case. One student from each group should present the group's findings to the class.

LO2 ABC and Selling and Administrative Expenses

C2. Sandee Star, the owner of Star Bakery, wants to know the profitability of each of her bakery's customer groups. She is especially interested in the State Institutions customer group, which is one of the company's largest. Currently, the bakery is selling doughnuts and snack foods to ten state institutions in three states. The controller has prepared the following income statement for the State Institutions customer group:

Star Bakery
Income Statement for State Institutions Customer Group
For the Year Ended December 31

Sales (\$5 per case × 50,000 cases)	\$250,000
Cost of goods sold (\$3.50 per case × 50,000 cases)	175,000
Gross margin	<u>\$ 75,000</u>
Less: Selling and administrative activity costs	94,750
Operating income (loss) contributed by State Institutions customer group	<u><u>(\$ 19,750)</u></u>

Activity	Activity Cost Rate	Actual Cost Driver Level	Activity Cost
Make sales calls	\$60 per sales call	60 sales calls	\$ 3,600
Prepare sales orders	10 per sales order	900 sales orders	9,000
Handle inquiries	5 per minute	1,000 minutes	5,000
Ship products	1 per case sold	50,000 cases	50,000
Process invoices	20 per invoice	950 invoices	19,000
Process credits	20 per notice	40 notices	800
Process billings and collections	7 per billing	1,050 billings	7,350
Total selling and administrative activity costs			<u><u>\$ 94,750</u></u>

The controller has also provided budgeted information about selling and administrative activities for the State Institutions customer group. For this year, the planned activity cost rates and the annual cost driver levels for each selling and administrative activity are as follows:

Activity	Planned Activity Cost Rate	Planned Annual Cost Driver Level
Make sales calls	\$60 per sales call	59 sales calls
Prepare sales orders	10 per sales order	850 sales orders
Handle inquiries	5.10 per minute	1,000 minutes
Ship products	0.60 per case sold	50,000 cases
Process invoices	1 per invoice	500 invoices
Process credits	10 per notice	5 notices
Process billings and collections	4 per billing	600 billings

You have been called in as a consultant on the State Institutions customer group.

1. Calculate the planned activity cost for each activity.
2. Calculate the differences between the planned activity cost and the State Institutions customer group's activity costs for this year.
3. From your evaluation of the differences calculated in 2 and your review of the income statement, identify the non-value-adding activities and state which selling and administrative activities should be examined.
4. What actions might the company take to reduce the costs of non-value-adding selling and administrative activities?

LO2 ABC in Planning and Control

C 3. Refer to the income statement in **C 2** for the State Institutions customer group for the year ended December 31. Sandee Star, the owner of Star Bakery, is in the process of budgeting income for next year. She has asked the controller to prepare a budgeted income statement for the State Institutions customer group. She estimates that the selling price per case, the number of cases sold, the cost of goods sold per case, and the activity costs for making sales calls, preparing sales orders, and handling inquiries will remain the same next year. She has contracted with a new freight company to ship the 50,000 cases at \$0.60 per case sold. She has also analyzed the procedures for invoicing, processing credits, billing, and collecting and has decided that it would be less expensive for a customer service agency to do the work. The agency will charge the bakery 1.5 percent of the total sales revenue.

1. Prepare a budgeted income statement for the State Institutions customer group for next year; the year ends December 31.
2. Refer to the information in **C 2**. Assuming that the planned activity cost rate and planned annual cost driver level for each selling and administrative activity remain the same next year, calculate the planned activity cost for each activity.
3. Calculate the differences between the planned activity costs (determined in **2**) and the State Institutions customer group's budgeted activity costs for next year (determined in **1**).
4. Evaluate the results of changing freight companies and outsourcing the customer service activities.

LO3 Lean in a Service Business

C 4. The initiation banquet for new members of your business club is being held at an excellent restaurant. You are sitting next to two college students who are majoring in marketing. In discussing the accounting course they are taking, they mention that they are having difficulty understanding the lean philosophy. They have read that the elements of a company's operating system support the concepts of simplicity, continuous improvement, waste reduction, timeliness, and efficiency. They realize that to understand lean thinking in a complex manufacturing environment, they must first understand lean in a simpler context. They ask you to explain the philosophy and provide an example.

Briefly explain the lean philosophy. Apply the elements of a JIT operating system to the restaurant where the banquet is being held. Do you believe the lean philosophy applies in all restaurant operations? Explain your answer.

LO3 Activities, Cost Drivers, and JIT

C 5. Fifteen years ago, Bruce Sable, together with 10 financial supporters, founded Sable Corporation. Located in Atlanta, the company originally manufactured roller skates, but 12 years ago, on the advice of its marketing department, it switched to making skateboards. More than 4 million skateboards later, Sable Corporation finds itself an industry leader in both volume and quality. To retain market share, it has decided to automate its manufacturing process. It has ordered flexible manufacturing systems for wheel assembly and board shaping. Manual operations will be retained for board decorating because some hand painting is involved. All operations will be converted to a just-in-time environment.

Bruce Sable wants to know how the JIT approach will affect the company's product costing practices and has called you in as a consultant.

1. Summarize the elements of a JIT environment.
2. How will the automated systems change product costing?
3. What are some cost drivers that the company should employ? In what situations should it employ them?

LO1 LO2 Cookie Company (Continuing Case)

LO3 LO5 C 6. As we continue with this case, assume that your company has been using a continuous manufacturing process to make chocolate chip cookies. Demand has been so great that the company has built a special plant that makes only custom-ordered cookies. The cookies are shaped by machines but vary according to the customer's specific instructions. Ten basic sizes of cookies are produced and then customized. Slight variations in machine setup produce the different sizes.

In the past six months, several problems have developed. Even though a computer-controlled machine is used in the manufacturing process, the company's backlog is growing rapidly, and customers are complaining that delivery is too slow. Quality is declining because cookies are being pushed through production without proper inspection. Working capital is tied up in excessive amounts of inventory and storage space. Workers are complaining about the pressure to produce the backlogged orders. Machine breakdowns are increasing. Production control reports are not useful because they are not timely and contain irrelevant information. The company's profitability and cash flow are suffering.

Assume that you have been appointed CEO and that the company has asked you to analyze its problems. The board of directors asks that you complete your preliminary analysis quickly so that you can present it to the board at its midyear meeting.

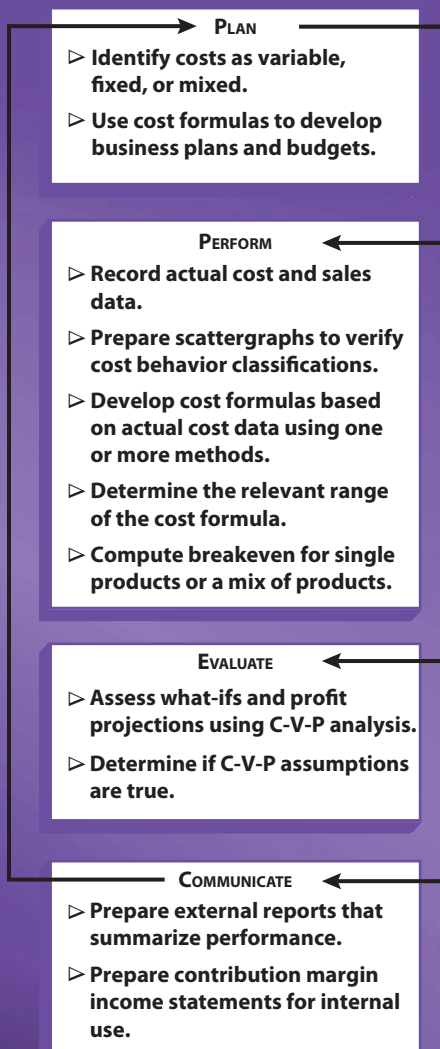
1. In memo form, prepare a preliminary report recommending specific changes in the manufacturing processes.
2. In preparing the report, answer the following questions:
 - a. Why are you preparing the report? What is its purpose?
 - b. Who is the audience for this report?
 - c. What kinds of information do you need to prepare the report, and where will you find it (i.e., what sources will you use)?
 - d. When do you need to obtain the information?

CHAPTER

6

Cost Behavior Analysis

The Management Process



Analysis of cost behavior is important not only in achieving profitability but also in using resources wisely.

Knowing how costs will behave is essential for managers as they chart their organization's course. Managers commonly analyze alternative courses of action using cost behavior information so they can select the course that will best generate income for an organization's owners, maintain liquidity for its creditors, and use the organization's resources responsibly.

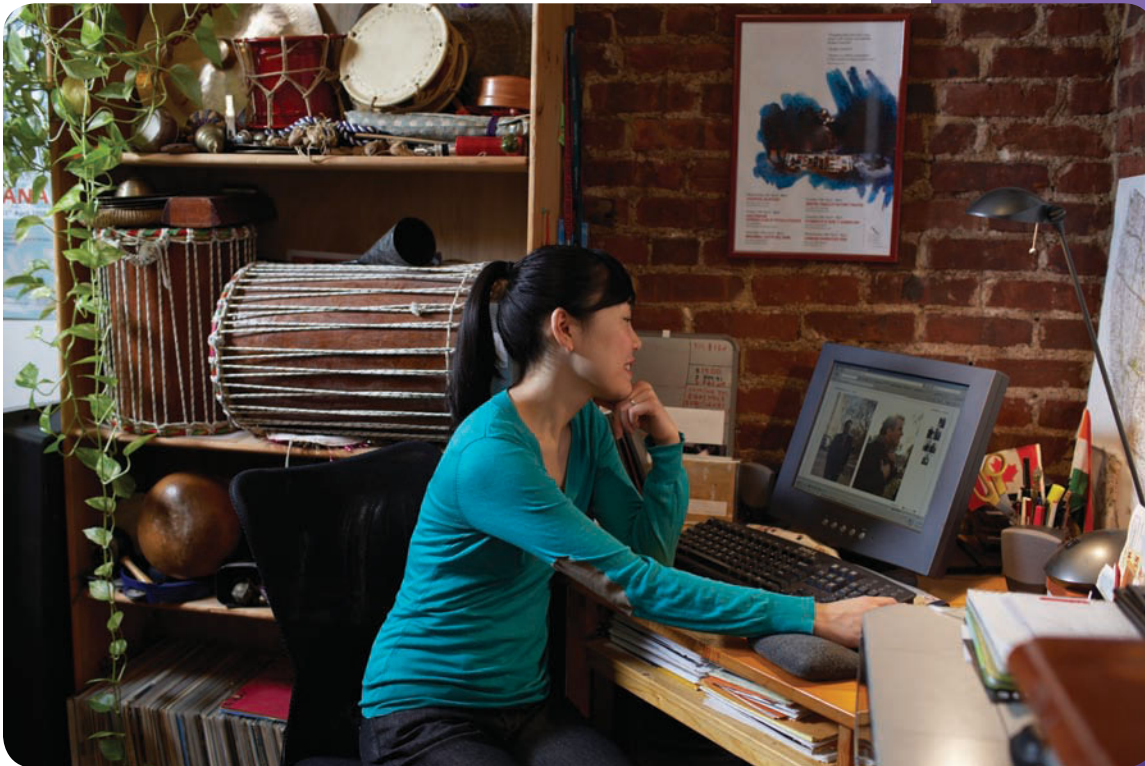
LEARNING OBJECTIVES

- LO1** Define *cost behavior*, and identify variable, fixed, and mixed costs. (pp. 208–213)
- LO2** Separate mixed costs into their variable and fixed components, and prepare a contribution margin income statement. (pp. 924–929)
- LO3** Define *cost-volume-profit (C-V-P) analysis*, and discuss how managers use it as a tool for planning and control. (pp. 218–220)
- LO4** Define *breakeven point*, and use contribution margin to determine a company's breakeven point for multiple products. (pp. 220–224)
- LO5** Use C-V-P analysis to project the profitability of products and services. (pp. 225–228)

DECISION POINT ► A MANAGER'S FOCUS FLICKR

The types of products and services that a company offers often vary from year to year depending on customers' preferences. For example, **Flickr**, which is today a very popular website for sharing personal photographs, evolved from an online game for multiple players called *Game Neverending* that was launched in 2002. The game was shelved in 2004, and the tools used in developing it were then used to develop a multiuser chat room with photo exchange capabilities. The chat room was eventually dropped as Flickr began focusing more on photo exchange. The site currently claims to host more than 4 billion images, and it offers two types of accounts: Free and Pro. It provides not only public and private photo and video storage but also a web services suite and an online community platform. The on-going challenge for Flickr's management is to offer a mix of services that appeals to customers and that allows the company to optimize its resources and profits.

- How does Flickr decide which services to offer?
- Why do Flickr's managers analyze cost behavior?



Cost Behavior and Management

LO1 Define *cost behavior*, and identify variable, fixed, and mixed costs.

Cost behavior—the way costs respond to changes in volume or activity—is a factor in almost every decision managers make. Managers commonly use it to analyze alternative courses of action so they can select the course that will best generate income for an organization’s owners, use resources wisely, and maintain liquidity for its creditors. The management process described on the first page of this chapter explains how managers use cost behavior when they plan, perform, evaluate, and communicate.

Service businesses like **Flickr**, **Facebook**, and **Google** find cost behavior analyses useful when planning the optimal mix of services to offer. For example, before officially adding a new feature, Google’s managers analyze its cost behavior in their online Google Labs to gather user data and feedback.

During the year, managers collect cost behavior data and use it in decision making. Managers must understand and anticipate cost behavior to determine the impact of their actions on operating income and resource optimization. For example, Google’s managers must understand the changes in income that can result from buying new, more productive servers or launching an online advertising product like AdWords or AdSense.

When evaluating operations and preparing reports for various product or service lines or geographic regions, managers in all types of organizations analyze how changes in cost and sales affect the profitability of product lines, sales territories, customers, departments, and other segments.

Although our focus in this chapter is on cost behavior as it relates to products and services, cost behavior can also be observed in selling, administrative, and general activities. For example, increases in the number of shipments affect shipping costs; the number of units sold or total sales revenue affects the cost of sales commissions; and the number of customers billed affects total billing costs. If managers can predict how costs behave, whether they are product- or service-related or are for selling, administrative, or general activities, then costs become manageable.

The Behavior of Costs

Some costs vary with volume or operating activity (variable costs). Others remain fixed as volume changes (fixed costs). Between those two extremes are costs that exhibit characteristics of each type (mixed costs).



FOCUS ON BUSINESS PRACTICE

A Different Kind of Company

Google’s informal motto is simple: “Don’t be evil.” In the preface to its Code of Conduct, Google states that “being a different kind of company” depends on employees’ applying the company’s core values “in all aspects of [their] lives as Google employees.”¹

The company’s Code of Conduct provides ethical guidelines in the following areas:

- ▶ Serving users
- ▶ Respecting each other
- ▶ Avoiding conflicts of interest
- ▶ Preserving confidentiality
- ▶ Maintaining books and records
- ▶ Protecting Google’s assets
- ▶ Obeying the law

Study Note

Variable costs change in *direct proportion* to changes in activity; that is, they increase *in total* with an increase in volume and decrease *in total* with a decrease in volume, but they remain the same on a *per unit* basis.

Variable Costs Total costs that change in direct proportion to changes in productive output (or any other measure of volume) are called **variable costs**. In a previous chapter we referred to them as unit-level activities since the cost is incurred each time a unit is produced or a service is delivered. For example, direct materials, direct labor, operating supplies, and gasoline are variable costs.

Total variable cost costs go up or down as volume increases or decreases, but the cost per unit remains unchanged, as demonstrated in Figure 6-1 by the linear relationship between direct labor and units produced. Notice the relationship graphs as a straight line. In the figure, each unit of output requires \$2.50 of labor cost. Total labor costs grow in direct proportion to the increase in units of output. For two units, total labor costs are \$5.00; for six units, the organization incurs \$15.00 in labor costs.

The **variable cost formula** for variable cost behavior is that of a straight line: $Y = a(X)$, where Y is total variable cost, a is the variable rate per unit, and X is the units produced. The cost formula for direct labor in Figure 6-1 is:

$$\text{Total Direct Labor Costs} = \$2.50 \times \text{Units Produced}$$

Figure 6-2 illustrates other examples of variable costs. All those costs—whether incurred by a manufacturer like **La-Z-Boy** or **Intel**; a service business like **Flickr**, **Facebook**, or **Google**; or a merchandiser like **Wal-Mart**—are variable based on either productive output or total sales.

Because variable costs increase or decrease in direct proportion to volume or output, it is important to know an organization’s operating capacity. **Operating capacity** is the upper limit of an organization’s productive output capability, given its existing resources. It describes just what an organization can accomplish in a given period. In our discussions, we assume that operating capacity is constant and that all activity occurs within the limits of current operating capacity.

There are three common measures, or types, of operating capacity: theoretical, or ideal, capacity; practical capacity; and normal capacity.

FIGURE 6-1
A Common Variable Cost Behavior Pattern: A Linear Relationship

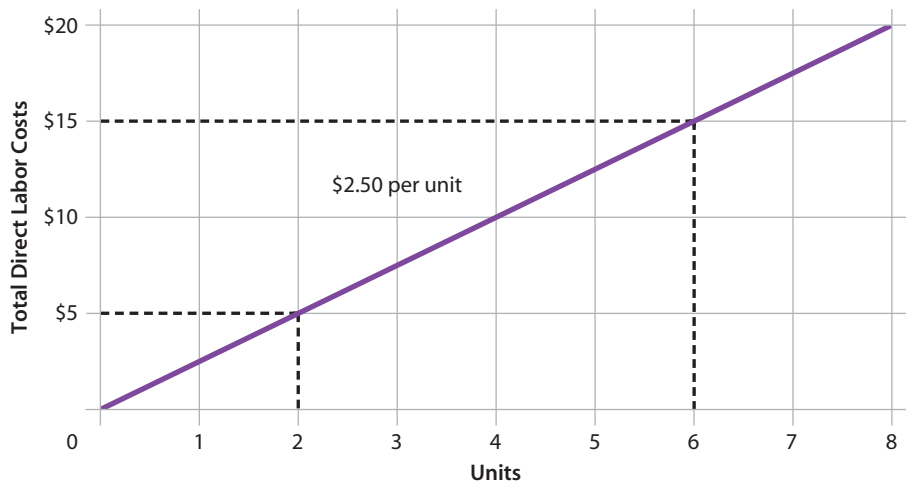


FIGURE 6-2 Examples of Variable, Fixed, and Mixed Costs



Costs	Manufacturing Company— Tire Manufacturer	Merchandising Company— Department Store	Service Company— Bank
VARIABLE	Direct materials Direct labor (hourly) Indirect labor (hourly) Operating supplies Small tools	Merchandise to sell Sales commissions Shelf stockers (hourly)	Computer equipment leasing (based on usage) Computer operators (hourly) Operating supplies Data storage disks
FIXED	Depreciation—machinery and building Insurance premiums Labor (salaried) Supervisory salaries Property taxes (on machinery and building)	Depreciation—equipment and building Insurance premiums Buyers (salaried) Supervisory salaries Property taxes (on equipment and building)	Depreciation—furniture and fixtures Insurance premiums Salaries: Programmers Systems designers Bank administrators Rent—buildings
MIXED	Electrical power Telephone Heat	Electrical power Telephone Heat	Electrical power Telephone Heat

- ▶ **Theoretical (ideal) capacity** is the maximum productive output for a given period in which all machinery and equipment are operating at optimum speed, without interruption. No company ever actually operates at such an ideal level.
- ▶ **Practical capacity** is theoretical capacity reduced by normal and expected work stoppages, such as machine breakdowns; downtime for retooling, repairs, and maintenance; and employees' breaks. Practical capacity is sometimes called *engineering capacity* and is used primarily as a planning goal of what could be produced if all went well, but no company ever actually operates at such a level.
- ▶ **Normal capacity** is the average annual level of operating capacity needed to meet expected sales demand. Normal capacity is the realistic measure of what an organization is *likely* to produce, not what it *can* produce. Thus, each variable cost should be related to an appropriate measure of normal capacity. For example, operating costs can be related to machine hours used or total units produced, and sales commissions usually vary in direct proportion to total sales dollars.

Study Note

An activity base is often called *denominator activity* or *cost driver*; it is the activity for which relationships are established. The basic relationships should not change greatly if activity fluctuates around the level of denominator activity.

Study Note

Because fixed costs are expected to hold relatively constant over the entire relevant range of activity, they can be described as the costs of providing capacity.

Study Note

Cost behavior is closely linked to the concept of cost control. In the short run, it is generally easier to control variable costs than fixed costs.

The basis for measuring the activity of variable costs should be carefully selected for two reasons:

- ▶ First, an appropriate activity base simplifies cost planning and control.
- ▶ Second, managers must combine (aggregate) many variable costs with the same activity base so that the costs can be analyzed in a reasonable way. Such aggregation also provides information that allows management to predict future costs.

The general guide for selecting an activity base is to relate costs to their most logical or causal factor. For example, direct material and direct labor costs should be considered variable in relation to the number of units produced.

Fixed Costs Fixed costs behave very differently from variable costs. Fixed costs are total costs that remain constant within a relevant range of volume or activity. **Relevant range** is the span of activity in which a company expects to operate. Within the relevant range, it is assumed that both total fixed costs and per unit variable costs are constant. In a previous chapter we referred to fixed costs as facility-level activities. Look back at Figure 6-2 for examples of fixed costs. The manufacturer, the department store, and the bank all incur depreciation costs and fixed annual insurance premiums. In addition, all salaried personnel have fixed earnings for a particular period. The manufacturer and the department store own their buildings and pay annual property taxes, and the bank pays an annual fixed rental charge for the use of its building.

According to economic theory, all costs tend to be variable in the long run; thus, as the examples in Figure 6-2 suggest, a cost is fixed only within a limited period. A change in plant capacity, labor needs, or other production factors causes fixed costs to increase or decrease. Management usually considers a one-year period when planning and controlling costs; thus fixed costs are expected to be constant within that period.

Of course, fixed costs change when activity exceeds the relevant range. These costs are called *step costs* or *step-variable*, *step-fixed*, or *semifixed costs*. A **step cost** remains constant in a relevant range of activity and increases or decreases in a step-like manner when activity is outside the relevant range.

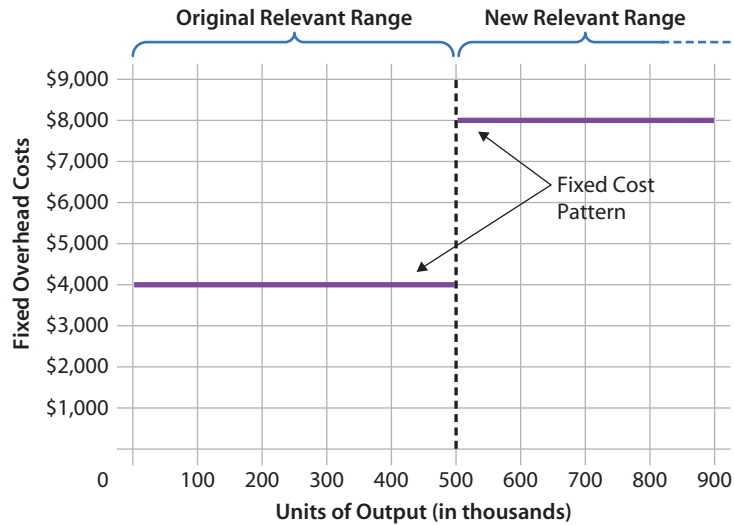
For example, assume that one customer support team at My Media Place, a company like **Flickr**, has the capacity to handle up to 500,000 customer incidents per 8-hour shift. The relevant range, then, is from 0 to 500,000 units. Unfortunately, volume has increased to more than 500,000 incidents per 8-hour shift, taxing current equipment capacity and the quality of customer care. My Media Place must add another customer support team to handle the additional volume. Figure 6-3 shows this behavior pattern. The fixed costs for the first 500,000 units of production are \$4,000. Those costs hold steady at \$4,000 for any level of output within the relevant range. But if output goes above 500,000 units, another team must be added, pushing fixed costs to \$8,000.

Fixed cost behavior expressed mathematically in the **fixed cost formula** is a horizontal line in the relevant range: $\mathcal{Y} = b$, where \mathcal{Y} is total fixed cost and b is the fixed cost in the relevant range. The fixed cost formula for up to 500,000 units in Figure 6-3 is:

$$\text{Total Fixed Costs} = \$4,000$$

On a per unit basis, fixed costs go down as volume goes up, as long as a firm is operating within the relevant range of activity. Look at how the customer

FIGURE 6-3
A Common Step-Like Fixed Cost Behavior Pattern



support team’s costs per unit fall as the volume of activity increases within the relevant range:

<i>Volume of Activity</i>	<i>Support Team Cost per Unit</i>
100,000 units	$\$4,000 \div 100,000 = \0.0400
300,000 units	$\$4,000 \div 300,000 = \0.0133^*
500,000 units	$\$4,000 \div 500,000 = \0.0080
600,000 units	$\$8,000 \div 600,000 = \0.0133^*

*Rounded.

At 600,000 units, the activity level is above the relevant range, which means another team must be added; thus, the per unit cost changes to \$0.0133.

Study Note

Mixed costs are common in businesses.

Mixed Costs Mixed costs have both variable and fixed cost components. Part of a mixed cost changes with volume or usage, and part is fixed over a particular period.

FIGURE 6-4
Behavior Patterns of Mixed Costs

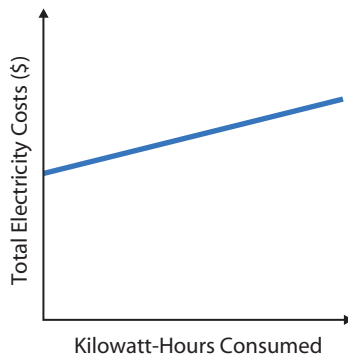
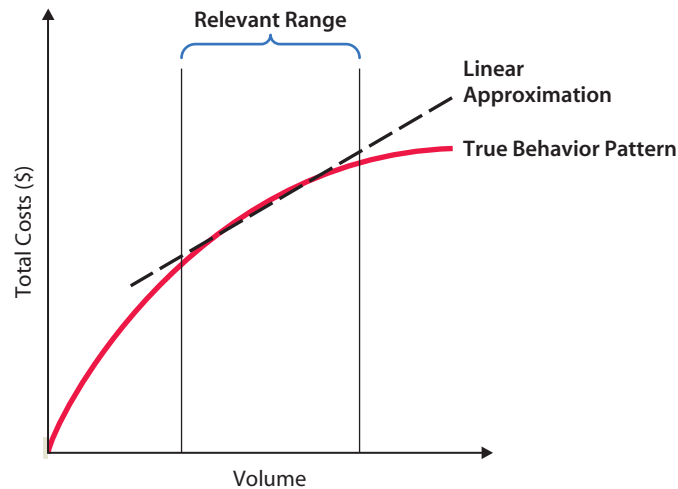


FIGURE 6-5
The Relevant Range and Linear Approximation



Study Note

Nonlinear costs can be roughly estimated by treating them as if they were linear (variable) costs within set limits of volume.

Mixed cost behavior is expressed mathematically in the **mixed cost formula**, which is the linear equation $Y = a(X) + b$, where Y is total mixed cost, a the variable rate per unit, X the units produced, and b the fixed cost for the period.

Many mixed costs vary with operating activity in a nonlinear fashion. To simplify cost analysis procedures and make mixed costs easier to use, accountants have developed a method of converting nonlinear costs into linear ones. Called *linear approximation*, this method relies on the concept of relevant range. Under that concept, many nonlinear costs can be estimated using the linear approximation approach illustrated in Figure 6-5. Those estimated costs can then be treated as part of the other variable and fixed costs.

A linear approximation of a nonlinear cost is not a precise measure, but it allows the inclusion of nonlinear costs in cost behavior analysis, and the loss of accuracy is usually not significant. The goal is to help management estimate costs and prepare budgets, and linear approximation helps accomplish that goal.

STOP & APPLY >

Indicate whether each of the following costs is usually variable (V) or fixed (F):

- | | |
|----------------------------------|---------------------------------------------------------------------------------------|
| 1. Operating supplies | 5. Depreciation expense of computers (calculated with the straight-line method) |
| 2. Real estate taxes | 6. Depreciation expense of machinery (calculated with the units-of-production method) |
| 3. Gasoline for a delivery truck | |
| 4. Property insurance | |

SOLUTION

1. V; 2. F; 3. V; 4. F; 5. F; 6. V

Mixed Costs and the Contribution Margin Income Statement

LO2 Separate mixed costs into their variable and fixed components, and prepare a contribution margin income statement.

For cost planning and control purposes, mixed costs must be divided into their variable and fixed components. The separate components can then be grouped with other variable and fixed costs for analysis. Four methods are commonly used to separate mixed cost components: the engineering, scatter diagram, high-low, and statistical methods.

- ▶ Because the results yielded by each of these four methods are likely to differ, managers often use multiple approaches to find the best possible estimate for a mixed cost.

The Engineering Method

The **engineering method** is used to separate costs into their fixed and variable components by performing a step-by-step analysis of the tasks, costs, and processes involved. This type of analysis is sometimes called a *time and motion study*. The engineering method is expensive because it is so detailed, and it is generally used to estimate the cost of activities or new products. For example, the U.S. Postal Service conducts periodic audits of how many letters a postal worker should be able to deliver on a particular mail route within a certain period.

The Scatter Diagram Method

When there is doubt about the behavior pattern of a particular cost, especially a mixed cost, it helps to plot past costs and related measures of volume in a scatter diagram. A **scatter diagram** is a chart of plotted points that helps determine whether a linear relationship exists between a cost item and its related activity measure. It is a form of linear approximation. If the diagram suggests a linear relationship, a cost line can be imposed on the data by either visual means or statistical analysis. For example, suppose that My Media Place incurred the following machine hours and electricity costs last year:

Like most businesses, the U.S. Postal Service is concerned about delivery time. To determine how many deliveries a postal worker should be able to make within a certain period, it conducts periodic audits using the engineering method (a type of analysis that is also known as a time and motion study).

Courtesy of Michelle Malven/
istockphoto.com.



<i>Month</i>	<i>Machine Hours</i>	<i>Electricity Costs</i>
January	6,250	\$ 24,000
February	6,300	24,200
March	6,350	24,350
April	6,400	24,600
May	6,300	24,400
June	6,200	24,300
July	6,100	23,900
August	6,050	23,600
September	6,150	23,950
October	6,250	24,100
November	6,350	24,400
December	6,450	24,700
Totals	<u>75,150</u>	<u>\$290,500</u>

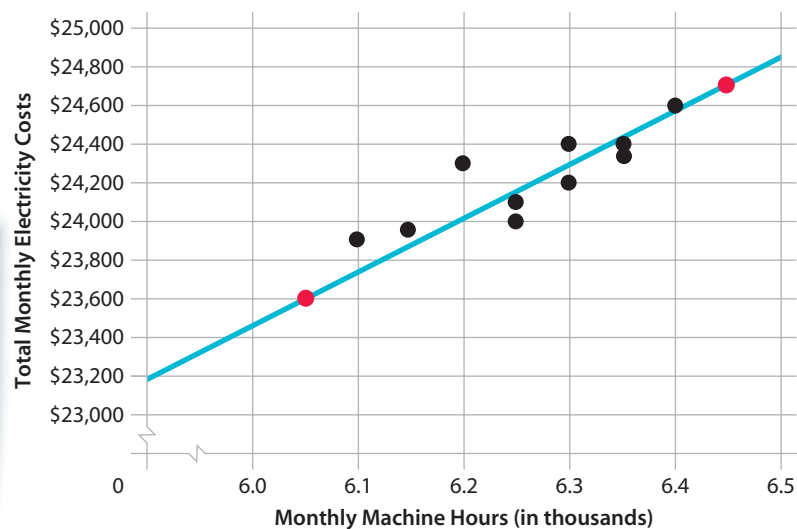
The High-Low Method

The **high-low method** is a common, three-step approach to determining the variable and fixed components of a mixed cost. It is based on the premise that only two data points are necessary to define a linear cost-volume relationship, $Y = a(X) + b$, where Y is total mixed cost, a is the variable rate per unit, X is the volume level, and b is the total fixed cost for the period. It is a relatively crude method since it uses only the high and low data observations to predict cost behavior.

- ▶ The disadvantage of this method is that if one or both data points are not representative of the remaining data set, the estimate of variable and fixed costs may not be accurate.
- ▶ Its advantage is that it can be used when only limited data are available.

FIGURE 6-6
Scatter Diagram of Machine Hours
and Electricity Costs

Study Note
A scatter diagram shows how closely volume and costs are correlated. A tight, closely associated group of data is better suited to linear approximation than a random or circular pattern of data points.



The method involves three steps:

1. Find the variable rate—that is, the a in $Y = a(X) + b$.
2. Find the total fixed costs—that is, the b in $Y = a(X) + b$.
3. Express the cost formula to estimate total costs within the relevant range:

$$Y = a(X) + b, \text{ or Total Cost} = \text{Variable Rate}(\text{Volume Level}) + \text{Fixed Costs}$$

Using My Media Place's last 12 months of machine usage and electric cost data, here is a step-by-step example of how to use the high-low method:

Step 1. *Find the variable rate.*

Study Note

Step 1 is also how you compute the slope of a line, that is, $\text{Change in } Y \div \text{Change in } X$.

- ▶ Select the periods of highest and lowest activity within the accounting period. In our example, the highest-volume machine-hour month was in December and the lowest was in August.
- ▶ Find the difference between the highest and lowest amounts for both the machine hours and their related electricity costs.
- ▶ Compute the variable rate, that is, the variable cost per machine hour, by dividing the difference in cost by the difference in machine hours.

<i>Volume</i>	<i>Month</i>	<i>Activity Level (X)</i>	<i>Cost (Y)</i>
High	December	6,450 hours	\$24,700
Low	August	6,050 hours	23,600
Difference		<u>400</u> hours	<u>\$ 1,100</u>

$$\begin{aligned} \text{Variable Cost per Machine Hour} &= \$1,100 \div 400 \text{ Machine Hours} \\ &= \$2.75 \text{ per Machine Hour} \end{aligned}$$

Step 2. *Find the total fixed costs.* Compute total fixed costs for a month by putting the known variable rate and the information from the month with the highest volume into the cost formula and solve for the total fixed costs:

$$\begin{aligned} \text{Total Fixed Costs} &= \text{Total Costs} - \text{Total Variable Costs} \\ \text{Total Fixed Costs for December} &= \$24,700.00 - (6,450 \text{ Hours} \times \$2.75) \\ &= \$6,962.50 \end{aligned}$$

You can check your answer by recalculating total fixed costs using the month with the lowest activity. Total fixed costs will be the same:

$$\begin{aligned} \text{Total Fixed Costs for August} &= \$23,600.00 - (6,050 \text{ Hours} \times \$2.75) \\ &= \$6,962.50 \end{aligned}$$

Step 3. *Express the cost formula to estimate the total costs within the relevant range.*

$$\text{Total Electricity Costs per Month} = \$2.75 \text{ per Machine Hour} + \$6,962.50$$

Remember that the cost formula will work only within the relevant range. In this example, the formula would work for amounts between 6,050 machine hours and 6,450 machine hours. To estimate the electricity costs for machine hours outside the relevant range (in this case, below 6,050 machine hours or above 6,450 machine hours), a new cost formula must be calculated.

Statistical Methods

Statistical methods, such as **regression analysis**, mathematically describe the relationship between costs and activities and are used to separate mixed costs into variable and fixed components. Because all data observations are used, the resulting linear equation is more representative of cost behavior than either the high-low or scatter diagram methods. Regression analysis can be performed using one or more activities to predict costs. For example, overhead costs can be predicted using only machine hours (a simple regression analysis), or they can be predicted using both machine hours and labor hours (a multiple regression analysis) because both activities affect overhead.

We leave further description of regression analysis to statistics courses, which provide detailed coverage of this method.

Contribution Margin Income Statements

Once an organization's costs are classified as being either variable or fixed, the traditional income statement can be reorganized into a more useful format for internal operations and decision making. Table 6-1 compares the structure of a traditional and a contribution margin income statement (sometimes referred to as a *variable costing income statement*). A **contribution margin income statement** is formatted to emphasize cost behavior rather than organizational functions. All variable costs related to production, selling, and administration are subtracted from sales to determine the total **contribution margin (CM)** (i.e., the amount that remains after all variable costs are subtracted from sales). All fixed costs related to production, selling, and administration are subtracted from the total contribution margin to determine operating income.

Although a traditional income statement and a contribution margin income statement arrive at the same operating income, the traditional approach divides costs into product and period costs, whereas the contribution margin approach divides costs into variable and fixed costs.

The contribution margin income statement enables managers to view revenue and cost relationships on a per unit basis or as a percentage of sales. If managers understand these relationships as expressed by the contribution margin income statement, then they can determine how many units they must sell to avoid losing money, or what the sales price per unit must be to cover costs, or what their profits will be for a certain dollar amount of sales revenue. In the next section, you will learn about cost-volume-profit analysis as a tool for planning and control. Table 6-2 shows the two ways a contribution margin income statement can be presented.

TABLE 6-1
Comparison of Income Statements

Traditional Income Statement	Contribution Margin Income Statement
Sales revenue	Sales revenue
– Cost of goods sold, variable	– Cost of goods sold, variable
– Cost of goods sold, fixed	– Operating expenses, variable
<hr/>	<hr/>
= Gross margin	= Contribution margin
– Operating expenses, variable	– Cost of goods sold, fixed
– Operating expenses, fixed	– Operating expenses, fixed
<hr/>	<hr/>
= Operating income	= Operating income
<hr/> <hr/>	<hr/> <hr/>

TABLE 6-2 Contribution Margin Income Statement

	Per unit Relationships	As a Percentage of Sales
Sales revenue	Sales price per unit \times Units sold	Sales revenue \div Sales revenue
Less variable costs	– Variable rate per unit \times Units sold	– Variable costs \div Sales revenue
Contribution margin	= Contribution margin per unit \times Units sold	= Contribution margin \div Sales revenue
Less fixed costs	– Total fixed costs	– Fixed costs
Operating income	= \$XXXXX	= Operating income

STOP & APPLY >

Using the high-low method and the following information, compute the monthly variable cost per kilowatt-hour and the monthly fixed electricity cost for a local business. Finally, express the monthly electricity cost formula and its relevant range.

Month	Kilowatt-Hours Used	Electricity Costs
April	90	\$450
May	80	430
June	70	420

SOLUTION

Volume	Month	Activity Level	Cost
High	April	90 hours	\$450
Low	June	70 hours	420
Difference		20 hours	\$ 30

Variable cost per kilowatt-hour = $\$30 \div 20$ hours
= \$1.50 per hour

Fixed costs for April: $\$450 - (90 \times \$1.50) = \$315$

Fixed costs for June: $\$420 - (70 \times \$1.50) = \$315$

Monthly electricity costs = $(\$1.50 \times \text{Hours}) + \315 . The cost formula can be used for hourly activity between 70 and 90 hours per month.

Cost-Volume-Profit Analysis

LO3 Define *cost-volume-profit (C-V-P) analysis*, and discuss how managers use it as a tool for planning and control.

Cost-volume-profit (C-V-P) analysis is an examination of the cost behavior patterns that underlie the relationships among cost, volume of output, and profit. C-V-P analysis usually applies to a single product, product line, or division of a company. For that reason, *profit*, which is only part of an entire company's operating income, is the term used in the C-V-P equation. The equation is expressed as

$$\text{Sales Revenue} - \text{Variable Costs} - \text{Fixed Costs} = \text{Profit}$$

$$S - VC - FC = P$$

Study Note

One of the important benefits of C-V-P analysis is that it allows managers to adjust different variables and to evaluate how these changes affect profit.

or as

$$\begin{aligned} \text{Sales Price(Units Sold)} - \text{Variable Rate(Units Sold)} - \text{Fixed Costs} &= \text{Profit} \\ SP(X) - VR(X) - FC &= P \end{aligned}$$

For example, suppose My Media Place wants to make a profit of \$50,000 on one of its services. The service sells for \$95.50 per unit and has variable costs of \$80 per unit. If 4,000 units are sold during the period, what were the fixed costs? Use the equation $SP(X) - VR(X) - FC = P$ to solve for the unknown fixed costs.

$$\begin{aligned} \$95.50(4,000) - \$80(4,000) - FC &= \$50,000 \\ \$382,000 - \$320,000 - FC &= \$50,000 \\ FC &= \$12,000 \end{aligned}$$

In cases involving the income statement of an entire company, the term *operating income* is more appropriate than *profit*. In the context of C-V-P analysis, however, *profit* and *operating income* mean the same thing.

C-V-P analysis is a tool for both planning and control. The techniques and the problem-solving procedures involved in the process express relationships among revenue, sales mix, cost, volume, and profit. Those relationships provide a general model of financial activity that managers can use for short-range planning and for evaluating performance and analyzing alternative courses of action.

For planning, managers can use C-V-P analysis to calculate operating income when sales volume is known, or they can determine the level of sales needed to reach a targeted amount of operating income. C-V-P analysis is used extensively in budgeting as well, and is also a way of measuring how well an organization's departments are performing. At the end of a period, sales volume and related actual costs are analyzed to find actual operating income. A department's performance is measured by comparing actual costs with expected costs—costs that have been computed by applying C-V-P analysis to actual sales volume. The result is a performance report on which managers can base the control of operations.

In addition, managers use C-V-P analysis to measure the effects of alternative courses of action, such as changing variable or fixed costs, expanding or contracting sales volume, and increasing or decreasing selling prices. C-V-P analysis is useful in making decisions about product pricing, product mix (when an organization makes more than one product or offers more than one service), adding or dropping a product line, and accepting special orders.

C-V-P analysis has many applications, all of which managers use to plan and control operations effectively. However, it is useful only under certain conditions and only when certain assumptions hold true. Those conditions and assumptions are as follows:

1. The behavior of variable and fixed costs can be measured accurately.
2. Costs and revenues have a close linear approximation throughout the relevant range. For example, if costs rise, revenues rise proportionately.
3. Efficiency and productivity hold steady within the relevant range of activity.
4. Cost and price variables also hold steady during the period being planned.
5. The sales mix does not change during the period being planned.
6. Production and sales volume are roughly equal.

If one or more of these conditions and assumptions are absent, the C-V-P analysis may be misleading.

STOP & APPLY >

A local business wants to make a profit of \$10,000 each month. It has variable costs of \$5 per unit and fixed costs of \$20,000 per month. How much must it charge per unit if 6,000 units are sold?

SOLUTION

Using the equation $SP(X) - VR(X) - FC = P$ to set up and solve for the unknown sales price:

$$SP(6,000) - \$5(6,000) - \$20,000 = \$10,000$$

$$SP = \frac{\$5(6,000) + \$20,000 + \$10,000}{6,000 \text{ Units}} = \frac{\$60,000}{6,000} = \$10 \text{ per Unit}$$

Breakeven Analysis

LO 4 Define *breakeven point*, and use contribution margin to determine a company's breakeven point for multiple products.

Breakeven analysis uses the basic elements of cost-volume-profit relationships. The **breakeven point** is the point at which total revenues equal total costs. It is thus the point at which an organization can begin to earn a profit. When a new venture or product line is being planned, the likelihood of the project's success can be quickly measured by finding its breakeven point. If, for instance, the breakeven point is 24,000 units and the total market is only 25,000 units, the margin of safety would be very low, and the idea should be considered carefully. The **margin of safety** is the number of sales units or amount of sales dollars by which actual sales can fall below planned sales without resulting in a loss—in this example, 1,000 units.

Sales (S), variable costs (VC), and fixed costs (FC) are used to compute the breakeven point, which can be stated in terms of sales units or sales dollars. The general equation for finding the breakeven point is as follows:

$$S - VC - FC = \$0$$

or as

$$SP(X) - VR(X) - FC = \$0$$

Suppose, for example, that one of the services My Media Place sells is website setups. Variable costs are \$50 per unit, and fixed costs average \$20,000 per year. A unit is a basic website setup which sells for \$90.

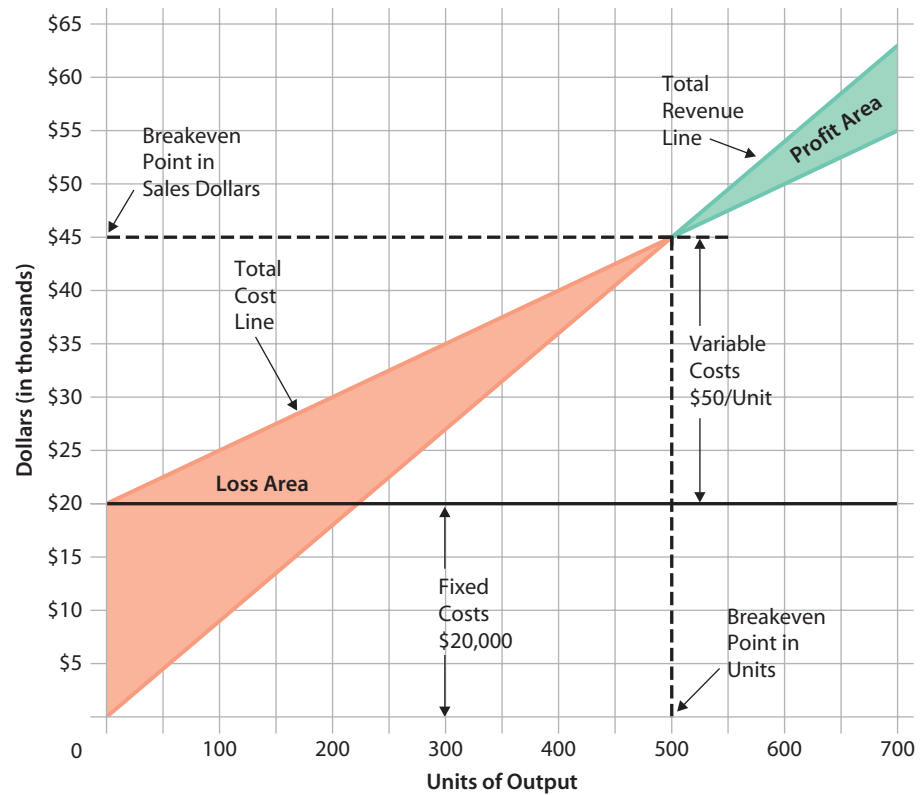
► **Breakeven in sales units:** Given this information, we can compute the breakeven point for website setup services in sales units (X equals sales units):

$$\begin{aligned} S - VC - FC &= \$0 \\ \$90X - \$50X - \$20,000 &= \$0 \\ \$40X &= \$20,000 \\ X &= 500 \text{ Units} \end{aligned}$$

► **Breakeven in sales dollars:** We can also compute breakeven in sales dollars since sales price multiplied by breakeven in sales units equals breakeven in sales dollars:

$$\$90 \times 500 \text{ Units} = \$45,000$$

FIGURE 6-7
Graphic Breakeven Analysis
for My Media Place



► **Breakeven by scatter diagram:** In addition, we can make a rough estimate of the breakeven point using a scatter diagram. This method is less exact, but it does yield meaningful data. Figure 6-7 shows a breakeven graph for My Media Place. As you can see there, the graph has five parts:

1. A horizontal axis for units of output
2. A vertical axis for dollars
3. A line running horizontally from the vertical axis at the level of fixed costs
4. A total cost line that begins at the point where the fixed cost line crosses the vertical axis and slopes upward to the right (The slope of the line depends on the variable cost per unit.)
5. A total revenue line that begins at the origin of the vertical and horizontal axes and slopes upward to the right (The slope depends on the selling price per unit.)

At the point at which the total revenue line crosses the total cost line, revenues equal total costs. The breakeven point, stated in either sales units or dollars of sales, is found by extending broken lines from this point to the axes. As Figure 6-7 shows, My Media Place will break even when it has sold 500 website setups for \$45,000.

Study Note

Contribution margin equals sales minus variable costs, whereas gross margin equals sales minus the cost of goods sold.

Using an Equation to Determine the Breakeven Point

A simpler method of determining the breakeven point uses contribution margin in an equation. You will recall from our discussion of the contribution margin income statement that the contribution margin (CM) is the amount that remains after all variable costs are subtracted from sales:

$$S - VC = CM$$

Study Note

The maximum contribution a unit of product or service can make is its selling price. After paying for itself (variable costs), a product or service provides a contribution margin to help pay total fixed costs and then earn a profit.

A product line's contribution margin represents its net contribution to paying off fixed costs and earning a profit. Profit (P) is what remains after fixed costs are paid and subtracted from the contribution margin:

$$\text{CM} - \text{FC} = \text{P}$$

The example that follows uses the contribution margin income statement approach to organize the facts and to determine the profitability of one of My Media Place's products.

Symbols	Units Produced and Sold		
	250	500	750
S Sales revenue (\$90 per unit)	\$22,500	\$45,000	\$67,500
VC Less variable costs (\$50 per unit)	12,500	25,000	37,500
CM Contribution margin (\$40 per unit)	\$10,000	\$20,000	\$30,000
FC Less fixed costs	20,000	20,000	20,000
P Profit (loss)	<u>(\$10,000)</u>	<u>\$ 0</u>	<u>\$10,000</u>

The breakeven point (BE) can be expressed as the point at which contribution margin minus total fixed costs equals zero (or the point at which contribution margin equals total fixed costs).

- ▶ **Breakeven in sales units:** In terms of units of product, the equation for the breakeven point looks like this:

$$(\text{CM per Unit} \times \text{BE Units}) - \text{FC} = \$0$$

It can also be expressed like this:

$$\text{BE Units} = \frac{\text{FC}}{\text{CM per unit}}$$

To show how the formula works, we use the data for My Media Place:

$$\text{BE Units} = \frac{\text{FC}}{\text{CM per unit}} = \frac{\$20,000}{\$90 - \$50} = \frac{\$20,000}{\$40} = 500 \text{ Units}$$

- ▶ **Breakeven in sales dollars:** The breakeven point in total sales dollars may be determined by multiplying the breakeven point in units by the selling price (SP) per unit:

$$\text{BE Dollars} = \text{SP} \times \text{BE Units} = \$90 \times 500 \text{ Units} = \$45,000$$

- ▶ An alternative way of determining the breakeven point in total sales dollars is to divide the fixed costs by the contribution margin ratio. The contribution margin ratio is the contribution margin divided by the selling price:

$$\text{CM Ratio} = \frac{\text{CM}}{\text{SP}} = \frac{\$40}{\$90} = 0.444^*, \text{ or } 4/9$$

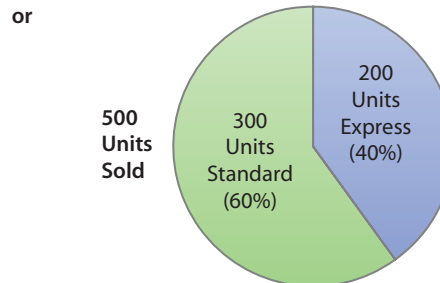
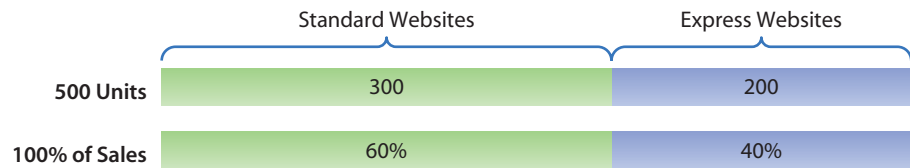
$$\text{BE Dollars} = \frac{\text{FC}}{\text{CM Ratio}} = \frac{\$20,000}{0.444} = \$45,045^*$$

The Breakeven Point for Multiple Products

To satisfy the needs of different customers, most companies sell a variety of products or services that often have different variable and fixed costs and different

*Rounded.

FIGURE 6-8
Sales Mix for My Media Place



Study Note

A company's sales mix can be very dynamic. If the mix is constantly changing, an assumption of stability may undermine the C-V-P analysis.

selling prices. To calculate the breakeven point for each product, its unit contribution margin must be weighted by the sales mix. The **sales mix** is the proportion of each product's unit sales relative to the company's total unit sales.

Let's assume that My Media Place sells two types of websites: standard and express. If the company sells 500 units, of which 300 units are standard and 200 are express, the sales mix would be 3:2. For every three standard websites sold, two express websites are sold. The sales mix can also be stated in percentages. Of the 500 units sold, 60 percent ($300 \div 500$) are standard sales, and 40 percent ($200 \div 500$) are express sales (see Figure 6-8).

The breakeven point for multiple products can be computed in three steps:

1. Compute the weighted-average contribution margin.
2. Calculate the weighted-average breakeven point.
3. Calculate the breakeven point for each product.

To illustrate, we will use My Media Place's sales mix of 60 percent standard websites to 40 percent express websites and total fixed costs of \$32,000; the selling price, variable cost, and contribution margin per unit for each product line are shown in Step 1 below.

Step 1. *Compute the weighted-average contribution margin.* To do so, multiply the contribution margin for each product by its percentage of the sales mix, as follows:

	Selling Price	Variable Costs	Contribution Margin (CM)	Percentage of Sales Mix	Weighted-Average CM
Standard	\$90	– \$50	= \$40	× 60%	= \$24
Express	\$40	– \$20	= \$20	× 40%	= 8
Weighted-average contribution margin					<u>\$32</u>

Step 2. *Calculate the weighted-average breakeven point.* Divide total fixed costs by the weighted-average contribution margin:

$$\begin{aligned}
 \text{Weighted-Average Breakeven Point} &= \text{Total Fixed Costs} \div \text{Weighted-Average Contribution Margin} \\
 &= \$32,000 \div \$32 \\
 &= 1,000 \text{ Units}
 \end{aligned}$$

Step 3. Calculate the breakeven point for each product. Multiply the weighted-average breakeven point by each product's percentage of the sales mix:

	<i>Weighted-Average Breakeven Point</i>		<i>Sales Mix</i>	=	<i>Breakeven Point</i>
Standard	1,000 units	×	60%	=	600 units
Express	1,000 units	×	40%	=	400 units

To verify, determine the contribution margin of each product and subtract the total fixed costs:

<i>Contribution Margin</i>	
Standard	600 × \$40 = \$24,000
Express	400 × \$20 = <u>8,000</u>
Total contribution margin	<u>\$32,000</u>
Less fixed costs	<u>32,000</u>
Profit	<u>\$ 0</u>

STOP & APPLY >

Using the contribution margin approach, find the breakeven point in units for a local business's two products. Product M's selling price per unit is \$20, and its variable cost per unit is \$11. Product N's selling price per unit is \$12, and its variable cost per unit is \$6. Fixed costs are \$24,000, and the sales mix of Product M to Product N is 2:1.

SOLUTION

Step 1.

	Selling Price	Variable Costs	Contribution Margin (CM)	Percentage of Sales Mix	Weighted-Average CM	
M	\$20	− \$11	= \$9	×	66.7%	= \$6
N	\$12	− \$6	= \$6	×	33.3%	= <u>2</u>
Weighted-average contribution margin						<u>\$8</u>

Step 2.

Weighted-Average Breakeven Point = \$24,000 ÷ \$8.00 = 3,000 Units

Step 3. Breakeven point for each product line:

	Weighted-Average Breakeven Point	×	Sales Mix	=	Breakeven Point
M	= 3,000 Units	×	0.667	=	2,000 Units
N	= 3,000 Units	×	0.333	=	1,000 Units

Check: Contribution Margin

Product M	=	2,000	×	\$9	=	\$18,000
Product N	=	1,000	×	\$6	=	<u>6,000</u>
Total contribution margin						<u>\$24,000</u>
Less fixed costs						<u>24,000</u>
Profit						<u>\$ 0</u>

Using C-V-P Analysis to Plan Future Sales, Costs, and Profits

LO5 Use C-V-P analysis to project the profitability of products and services.

The primary goal of a business venture is not to break even; it is to generate profits. C-V-P analysis adjusted for targeted profit can be used to estimate the profitability of a venture. This approach is excellent for “what-if” analysis, in which managers select several scenarios and compute the profit that may be anticipated from each. Each scenario generates a different amount of profit or loss.

For instance, what if sales increase by 17,000 units? What effect will the increase have on profit? What if sales increase by only 6,000 units? What if fixed costs are reduced by \$14,500? What if the variable unit cost increases by \$1.40?

Applying C-V-P to Target Profits

To illustrate two ways a business can apply C-V-P analysis to target profits, assume that My Media Place has set \$4,000 in profit as this year’s goal. If all the data in our earlier example remain the same, how many websites must My Media Place sell to reach the targeted profit?

► *Contribution margin approach:*

$$\begin{aligned} S &= VC + FC + P \\ \$90X &= \$50X + \$20,000 + \$4,000 \\ \$40X &= \$24,000 \\ X &= 600 \text{ Units} \end{aligned}$$

► *Equation approach:* Add the targeted profit to the numerator of the contribution margin breakeven equation and solve for targeted sales in units:

$$\text{Targeted Sales Units} = \frac{FC + P}{\text{CM per Unit}}$$

The number of sales units My Media Place needs to generate \$4,000 in profit is computed this way:

$$\begin{aligned} \text{Targeted Sales Units} &= \frac{FC + P}{\text{CM per Unit}} = \frac{\$20,000 + \$4,000}{\$40} = \frac{\$24,000}{\$40} \\ &= 600 \text{ Units} \end{aligned}$$

To summarize My Media Place’s plans for the coming year, a contribution margin income statement can be used. As you can see in the contribution margin income statement for My Media Place shown below, the focus of such a statement is on cost behavior, *not* cost function. (As we noted earlier, in income statements, the term *operating income* is more appropriate than *profit*.)

My Media Place’s planning team wants to consider three alternatives to the original plan shown in the statement. In the following sections, we examine each

Contribution Margin Income Statement For the Year Ended December 31

	Per Unit	Total for 600 Units
Sales revenue	\$90	\$54,000
Less variable costs	<u>50</u>	<u>30,000</u>
Contribution margin	<u>\$40</u>	<u>\$24,000</u>
Less fixed costs		<u>20,000</u>
Operating income		<u>\$ 4,000</u>

of these alternatives and its impact on projected operating income. In the summary, we review our work from a strategic management perspective and analyze the different breakeven points of the three alternatives.

What-If Alternative 1: Decrease Variable Costs, Increase Sales Volume

What if website design labor were outsourced? Based on the planning team's research, the direct labor cost of a website would decrease by \$3 to \$47 and sales volume would increase by 10 percent to 660 units. How does this alternative affect operating income?

	<i>Per Unit</i>	<i>Total for 660 Units</i>
Sales revenue	\$90	\$59,400
Less variable costs	<u>47</u>	<u>31,020</u>
Contribution margin	<u>\$43</u>	<u>\$28,380</u>
Less fixed costs		<u>20,000</u>
Operating income		<u>\$ 8,380</u>
<i>Alternative 1:</i>		
<i>Increase in operating income (\$8,380 – \$4,000)</i>		<u>\$ 4,380</u>

What-If Alternative 2: Increase Fixed Costs, Increase Sales Volume

What if the Marketing Department suggests that a \$500 increase in advertising costs would increase sales volume by 5 percent to 630 units? How does this alternative affect operating income?

	<i>Per Unit</i>	<i>Total for 630 Units</i>
Sales revenue	\$90	\$56,700
Less variable costs	<u>50</u>	<u>31,500</u>
Contribution margin	<u>\$40</u>	<u>\$25,200</u>
Less fixed costs		<u>20,500</u>
Operating income		<u>\$ 4,700</u>
<i>Alternative 2:</i>		
<i>Increase in operating income (\$4,700 – \$4,000)</i>		<u>\$ 700</u>

What-If Alternative 3: Increase Selling Price, Decrease Sales Volume

What is the impact of a \$10 increase in selling price on the company's operating income? If the selling price is increased, the planning team estimates that the sales volume will decrease by 15 percent to 510 units. How does this alternative affect operating income?

	<i>Per Unit</i>	<i>Total for 510 Units</i>
Sales revenue	\$100	\$51,000
Less variable costs	<u>50</u>	<u>25,500</u>
Contribution margin	<u>\$ 50</u>	<u>\$25,500</u>
Less fixed costs		<u>20,000</u>
Operating income		<u>\$ 5,500</u>
<i>Alternative 3:</i>		
<i>Increase in operating income (\$5,500 – \$4,000)</i>		<u>\$ 1,500</u>

Study Note

Remember that the breakeven point provides a rough estimate of the number of units that must be sold to cover the total costs.

Comparative Summary In preparation for a meeting, the planning team at My Media Place compiled the summary presented in Exhibit 6-1. It compares the three alternatives with the original plan and shows how changes in variable and fixed costs, selling price, and sales volume affect the breakeven point.

- ▶ Note that the decrease in variable costs (direct materials) proposed in Alternative 1 increases the contribution margin per unit (from \$40 to \$43), which reduces the breakeven point. Because fewer sales dollars are required to cover variable costs, the breakeven point is reached sooner than in the original plan—at a sales volume of 466 units rather than at 500 units.
- ▶ In Alternative 2, the increase in fixed costs has no effect on the contribution margin per unit, but it does require the total contribution margin to cover more fixed costs before reaching the breakeven point. Thus, the breakeven point is higher than in the original plan—513 units as opposed to 500.
- ▶ The increase in selling price in Alternative 3 increases the contribution margin per unit, which reduces the breakeven point. Because more sales dollars are available to cover fixed costs, the breakeven point of 400 units is lower than the breakeven point in the original plan.

From a strategic standpoint, which plan should the planning team choose? If they want the highest operating income, they will choose Alternative 1. If, however, they want the company to begin generating operating income more quickly, they will choose the plan with the lowest breakeven point, Alternative 3.

Additional qualitative information may help the planning team make a better decision. Will customers perceive that the quality of the website is lower if the company outsources the web work, as proposed in Alternative 1? Will increased expenditures on advertising yield a 5 percent increase in sales volume, as Alternative 2 suggests? Will the increase in selling price suggested in Alternative 3 create more than a 15 percent decline in unit sales?

Quantitative information is essential for planning, but managers must also be sensitive to qualitative factors, such as product quality, reliability and quality of suppliers, and availability of human and technical resources.

EXHIBIT 6-1

Comparative Summary of Alternatives at My Media Place

	Original Plan	Alternative 1	Alternative 2	Alternative 3
	Totals for 600 Units	Decrease Direct Materials Costs for 660 Units	Increase Advertising Costs for 630 Units	Increase Selling Price for 510 Units
Sales revenue	\$54,000	\$59,400	\$56,700	\$51,000
Less variable costs	30,000	31,020	31,500	25,500
Contribution margin	\$24,000	\$28,380	\$25,200	\$25,500
Less fixed costs	20,000	20,000	20,500	20,000
Operating income	\$ 4,000	\$ 8,380	\$ 4,700	\$ 5,500
Breakeven point in whole units (FC ÷ CM)				
\$20,000 ÷ \$40 =	500			
\$20,000 ÷ \$43 =		466*		
\$20,500 ÷ \$40 =			513*	
\$20,000 ÷ \$50 =				400

*Rounded up to next whole unit.

STOP & APPLY >

Assume a local real estate appraisal business is planning its home appraisal activities for the coming year. The manager estimates that her variable costs per appraisal will be \$220, monthly fixed costs are \$16,200, and service fee revenue will be \$400 per appraisal. How many appraisals will the business have to perform each month to achieve a targeted profit of \$18,000 per month?

SOLUTION

$$\begin{aligned}
 &\text{Let } X = \text{Targeted Sales in Units} \\
 &S - VC - FC = P \\
 &\$400X - \$220X - \$16,200 = \$18,000 \\
 &\$180X = \$34,200 \\
 &X = 190 \text{ Appraisals per Month}
 \end{aligned}$$

A LOOK BACK AT ► FLICKR



The Decision Point at the beginning of this chapter focused on **Flickr**, a company whose business is continually evolving to meet customers’ preferences. It posed these questions:

- How does Flickr decide which services to offer?
- Why do Flickr’s managers analyze cost behavior?

In Flickr’s quest to add services its subscribers want, its managers must consider the variable and fixed costs of producing those services and the effect that they would have on resource usage and profitability. To ensure that their decisions about adding services will profit the company and make the best use of its resources, the managers must analyze cost behavior. They may use a variety of methods and formulas to separate mixed costs into their variable and fixed components. With an understanding of cost behavior patterns, they can use cost-volume-profit analysis to evaluate “what-if” scenarios and to determine selling prices that cover both fixed and variable costs and take into account the variability of demand for their company’s services.

Review Problem

Breakeven Analysis
and Profitability
Planning

LO4 LO5

Suppose a company like Flickr is considering entering the online digital lockbox business by renting server space to customers to store any type of computer file. The company’s managers believe this business has a large potential market as more individuals and small businesses are moving their file backups to secure online servers that can be accessed around the clock. Here is a summary of data projections for this business:

Selling price per year per customer account:	\$95
Direct supplies	\$23
Direct labor	8
Overhead	6
Selling expense	<u>5</u>
Variable costs per unit	<u>\$42</u>
Overhead	\$195,000
Advertising	55,000
Administrative expense	<u>68,000</u>
Total annual fixed costs	<u><u>\$318,000</u></u>

Required

1. Compute the annual breakeven point in customer accounts.
2. Suppose managers projects sales to 6,500 customer accounts next year. If that projection is accurate, how much profit will the company realize?
3. To improve profitability, management is considering the following four alternative courses of action. (In performing the required steps, use the figures from items 1 and 2, and treat each alternative independently.)
 - a. Calculate the number of digital lockbox accounts that must be sold to generate a targeted profit of \$95,400. Assume that costs and selling price remain constant.
 - b. Calculate the operating income if the company increases the number of accounts sold by 20 percent and cuts the selling price by \$5 per account.
 - c. Determine the number of accounts that must be sold to break even if advertising costs (fixed costs) increase by \$47,700.
 - d. Find the number of accounts that must be sold to generate a targeted profit of \$120,000 if variable costs decrease by 10 percent.

Answers to Review Problem

1. Annual breakeven point in customer accounts:

$$\text{Breakeven Units} = \frac{\text{FC}}{\text{CM per Unit}} = \frac{\$318,000}{\$95 - \$42} = \frac{\$318,000}{\$53} = 6,000 \text{ Units}$$

2. Profit from sale of 6,500 accounts:

Units sold	6,500
Units required to break even	<u>6,000</u>
Units over breakeven	<u>500</u>

$$\text{Profit} = \$53 \text{ per unit} \times 500 = \$26,500$$

Contribution margin equals sales minus all variable costs. Contribution margin per account equals the amount left to cover fixed costs and earn a profit after variable costs have been subtracted from sales dollars. If all fixed costs have been absorbed by the time breakeven is reached, the entire contribution margin of each unit sold in excess of breakeven represents profit.

3. a. Number of accounts that must be sold to generate a targeted profit of \$95,400:

$$\text{Targeted Sales Units} = \frac{\text{FC} + \text{P}}{\text{CM per Unit}}$$

$$\frac{\$318,000 + \$95,400}{\$53} = \frac{\$413,400}{\$53} = 7,800 \text{ Units}$$

- b. Operating income if account sales increase 20 percent and selling price per account decreases by \$5:

Sales revenue [7,800 (6,500 × 1.20) accounts at \$90 per account]	\$702,000
Less variable costs (7,800 units × \$42)	<u>327,600</u>
Contribution margin	\$374,400
Less fixed costs	<u>318,000</u>
Operating income	<u>\$ 56,400</u>

- c. Number of accounts needed to break even if advertising costs (fixed costs) increase by \$47,700:

$$\text{BE Units} = \frac{\text{FC}}{\text{CM per Unit}}$$

$$\frac{\$318,000 + \$47,700}{\$53} = \frac{\$365,700}{\$53} = 6,900 \text{ Units}$$

- d. Number of accounts that must be sold to generate a targeted profit of \$120,000 if variable costs decrease by 10 percent:

$$\text{CM per Account} = \$95.00 - (\$42.00 \times 0.90) = \$95.00 - \$37.80 = \$57.20$$

$$\text{Targeted Sales Units} = \frac{\text{FC} + \text{P}}{\text{CM per Unit}}$$

$$\frac{\$318,000 + \$120,000}{\$57.20} = \frac{\$438,000}{\$57.20} = 7,658 \text{ Units}^*$$

*Note that the answer is rounded up to the next whole unit.

STOP & REVIEW >

LO1 Define *cost behavior*, and identify *variable, fixed, and mixed costs*.

Cost behavior is the way costs respond to changes in volume or activity. Some costs vary in relation to volume or operating activity; other costs remain fixed as volume changes. Cost behavior depends on whether the focus is total costs or cost per unit. Total costs that change in direct proportion to changes in productive output (or any other volume measure) are called *variable costs*. They include hourly wages, the cost of operating supplies, direct materials costs, and the cost of merchandise. Total *fixed costs* remain constant within a relevant range of volume or activity. They change only when volume or activity exceeds the relevant range—for example, when new equipment or new buildings must be purchased, higher insurance premiums and property taxes must be paid, or additional supervisory personnel must be hired to accommodate increased activity. A *mixed cost*, such as the cost of electricity, has both variable and fixed cost components.

LO2 Separate mixed costs into their variable and fixed components, and prepare a contribution margin income statement.

For cost planning and control, mixed costs must be separated into their variable and fixed components. To separate them, managers use a variety of methods, including the engineering, scatter diagram, high-low, and statistical methods. When preparing a contribution margin income statement, all variable costs related to production, selling, and administration are subtracted from sales to determine the total contribution margin; then, all fixed costs are subtracted from the total contribution margin to determine operating income.

LO3 Define *cost-volume-profit (C-V-P) analysis*, and discuss how managers use it as a tool for planning and control.

Cost-volume-profit analysis is an examination of the cost behavior patterns that underlie the relationships among cost, volume of output, and profit. It is a tool for both planning and control. The techniques and problem-solving procedures involved in C-V-P analysis express relationships among revenue, sales mix, cost, volume, and profit. Those relationships provide a general model of financial activity that management can use for short-range planning and for evaluating performance and analyzing alternatives.

LO4 Define *breakeven point*, and use contribution margin to determine a company's breakeven point for multiple products.

The *breakeven point* is the point at which total revenues equal total costs—in other words, the point at which net sales equal variable costs plus fixed costs. Once the number of units needed to break even is known, the number can be multiplied by the product's selling price to determine the breakeven point in sales dollars. *Contribution margin* is the amount that remains after all variable costs have been subtracted from sales. A product's contribution margin represents its net contribution to paying off fixed costs and earning a profit. The breakeven point in units can be computed by using the following formula:

$$\text{BE Units} = \frac{\text{FC}}{\text{CM per Unit}}$$

Sales mix is used to calculate the breakeven point for each product when a company sells more than one product.

LO5 Use C-V-P analysis to project the profitability of products and services.

The addition of targeted profit to the breakeven equation makes it possible to plan levels of operation that yield the targeted profit. The formula in terms of contribution margin is

$$\text{Targeted Sales Units} = \frac{\text{FC} + \text{P}}{\text{CM per Unit}}$$

C-V-P analysis, whether used by a manufacturing company or a service organization, enables managers to select several “what-if” scenarios and evaluate the outcome of each to determine which will generate the desired amount of profit.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

- Breakeven point 221 (LO4)
- Contribution margin (CM) 217 (LO2)
- Contribution margin income statement 217 (LO2)
- Cost behavior 208 (LO1)
- Cost-volume-profit (C-V-P) analysis 219 (LO3)
- Engineering method 214 (LO2)
- Fixed cost formula 211 (LO1)
- Fixed costs 211 (LO1)
- High-low method 931 (LO2)
- Margin of safety 221 (LO4)
- Mixed cost formula 213 (LO1)
- Mixed costs 212 (LO1)
- Normal capacity 210 (LO1)
- Operating capacity 209 (LO1)
- Practical capacity 210 (LO1)
- Regression analysis 217 (LO2)
- Relevant range 211 (LO1)
- Sales mix 224 (LO4)
- Scatter diagram 214 (LO2)
- Step cost 211 (LO1)
- Theoretical (ideal) capacity 210 (LO1)
- Variable cost formula 209 (LO1)
- Variable costs 209 (LO1)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Concept of Cost Behavior

SE 1. Dapper Hat Makers is in the business of designing and producing specialty hats. The material used for derbies costs \$4.50 per unit, and Dapper pays each of its two full-time employees \$360 per week. If Employee A makes 15 derbies in one week, what is the variable cost per derby, and what is this worker's fixed cost per derby? If Employee B makes only 12 derbies in one week, what are this worker's variable and fixed costs per derby?

L01 Identification of Variable, Fixed, and Mixed Costs

SE 2. Identify the following as (a) fixed costs, (b) variable costs, or (c) mixed costs:

1. Direct materials
2. Electricity
3. Operating supplies
4. Personnel manager's salary
5. Factory building rent

L02 Mixed Costs: High-Low Method

SE 3. Using the high-low method and the following information, compute the monthly variable cost per telephone hour and total fixed costs for Sadiko Corporation.

Month	Telephone Hours Used	Telephone Costs
April	96	\$4,350
May	93	4,230
June	105	4,710

L02 Contribution Margin Income Statement

SE 4. Prepare a contribution margin income statement if DeLuca, Inc., wants to make a profit of \$20,000. It has variable costs of \$8 per unit and fixed costs of \$12,000. How much must it charge per unit if 4,000 units are sold?

L04 Breakeven Analysis in Units and Dollars

SE 5. How many units must Braxton Company sell to break even if the selling price per unit is \$8.50, variable costs are \$4.30 per unit, and fixed costs are \$3,780? What is the breakeven point in total dollars of sales?

L04 Contribution Margin in Units

SE 6. Using the contribution margin approach, find the breakeven point in units for Norcia Consumer Products if the selling price per unit is \$11, the variable cost per unit is \$6, and the fixed costs are \$5,500.

L04 Contribution Margin Ratio

SE 7. Compute the contribution margin ratio and the breakeven point in total sales dollars for Wailley Products if the selling price per unit is \$16, the variable cost per unit is \$6, and the fixed costs are \$6,250.

L04 Breakeven Analysis for Multiple Products

SE 8. Using the contribution margin approach, find the breakeven point in units for Sardinia Company's two products. Product A's selling price per unit is \$10,

and its variable cost per unit is \$4. Product B's selling price per unit is \$8, and its variable cost per unit is \$5. Fixed costs are \$15,000, and the sales mix of Product A to Product B is 2:1.

L04 L05 Contribution Margin and Projected Profit

SE 9. If Oui Watches sells 300 watches at \$48 per watch and has variable costs of \$18 per watch and fixed costs of \$4,000, what is the projected profit?

L02 Monthly Costs and the High-Low Method

SE 10. Guy Spy, a private investigation firm, investigated 91 cases in December and had the following costs: direct labor, \$190 per case; and service overhead of \$20,840. Service overhead for October was \$21,150; for November, it was \$21,350. The number of cases investigated during October and November was 93 and 97, respectively. Compute the variable and fixed cost components of service overhead using the high-low method. Then determine the variable and fixed costs per case for December. (Round to nearest dollar where necessary.)

Exercises

L01 Identification of Variable and Fixed Costs

E 1. Indicate whether each of the following costs of productive output is usually (a) variable or (b) fixed:

1. Packing materials for stereo components
2. Real estate taxes
3. Gasoline for a delivery truck
4. Property insurance
5. Depreciation expense of buildings (calculated with the straight-line method)
6. Supplies
7. Indirect materials
8. Bottles used to package liquids
9. License fees for company cars
10. Wiring used in radios
11. Machine helper's wages
12. Wood used in bookcases
13. City operating license
14. Machine depreciation based on machine hours used
15. Machine operator's hourly wages
16. Cost of required outside inspection of each unit produced

L01 Variable Cost Analysis

E 2. Zero Time Oil Change has been in business for six months. The company pays \$0.50 per quart for the oil it uses in servicing cars. Each job requires an average of 4 quarts of oil. The company estimates that in the next three months, it will service 240, 288, and 360 cars.

1. Compute the cost of oil for each of the three months and the total cost for all three months.

Month	Cars to Be Serviced	Required Quarts/Car	Cost/Quart	Total Cost/Month
1	240	4	\$0.50	_____
2	288	4	0.50	_____
3	360	4	0.50	_____
Three-month total	<u>888</u>			<u>_____</u>

2. Complete the following sentences by choosing the words that best describe the cost behavior at Zero Time Oil Change:
 - a. Cost per unit (increased, decreased, remained constant).
 - b. Total variable cost per month (increased, decreased) as the quantity of oil used (increased, decreased).

L02 Mixed Costs: High-Low Method

E 3. Whitehouse Company manufactures major appliances. Because of growing interest in its products, it has just had its most successful year. In preparing the budget for next year, its controller compiled these data:

Month	Volume in Machine Hours	Electricity Cost
July	6,000	\$ 60,000
August	5,000	53,000
September	4,500	49,500
October	4,000	46,000
November	3,500	42,500
December	3,000	39,000
Six-month total	<u>26,000</u>	<u>\$290,000</u>

Using the high-low method, determine the variable electricity cost per machine hour and the monthly fixed electricity cost. Estimate the total variable electricity costs and fixed electricity costs if 4,800 machine hours are projected to be used next month.

L02 Mixed Costs: High-Low Method

E 4. When Jerome Company's monthly costs were \$75,000, sales were \$80,000; when its monthly costs were \$60,000, sales were \$50,000. Use the high-low method to develop a monthly cost formula for Jerome's coming year.

L02 L04 Contribution Margin Income Statement and Ratio

E 5. Senora Company manufactures a single product that sells for \$110 per unit. The company projects sales of 500 units per month. Projected costs are as follows:

Type of Cost	Manufacturing	Nonmanufacturing
Variable	\$10,000	\$5,000
Nonvariable	\$12,500	\$7,500

1. Prepare a contribution margin income statement for the month.
2. What is the contribution margin ratio?
3. What volume, in terms of units, must the company sell to break even?

L04 L05 Contribution Margin Income Statement and C-V-P Analysis

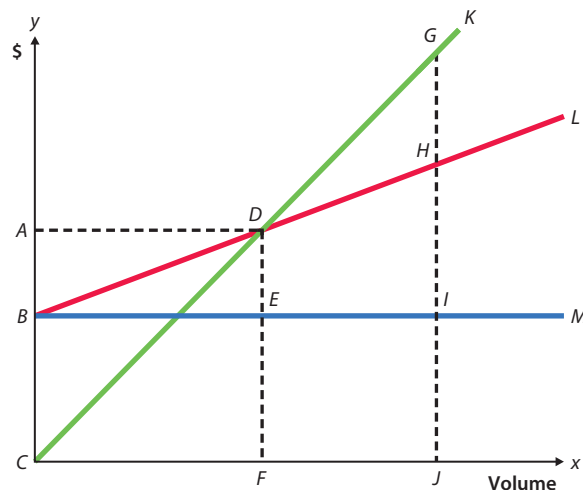
E 6. Using the data in the contribution margin income statement for Sedona, Inc., that appears at the top of the next page, calculate (1) selling price per unit, (2) variable costs per unit, and (3) breakeven point in units and in sales dollars.

Sedona, Inc.		
Contribution Margin Income Statement		
For the Year Ended December 31		
Sales (10,000 units)		\$16,000,000
Less variable costs		
Cost of goods sold	\$8,000,000	
Selling, administrative, and general	<u>4,000,000</u>	
Total variable costs		<u>12,000,000</u>
Contribution margin		\$ 4,000,000
Less fixed costs		
Overhead	\$1,200,000	
Selling, administrative, and general	<u>800,000</u>	
Total fixed costs		<u>2,000,000</u>
Operating income		<u>\$ 2,000,000</u>

L04 Graphic Breakeven Analysis

E 7. Identify the letter of the point, line segment, or area of the breakeven graph shown below that correctly completes each of the following statements:

- The maximum possible operating loss is
 - A
 - D
 - B
 - F
- The breakeven point in sales dollars is
 - C
 - D
 - A
 - G
- At volume F, total contribution margin is
 - C
 - D
 - E
 - G
- Operating income is represented by area
 - KDL
 - KCJ
 - BDC
 - GCJ
- At volume J, total fixed costs are represented by
 - H
 - G
 - I
 - J
- If volume increases from F to J, the change in total costs is
 - HI minus DE
 - DF minus HJ
 - BC minus DF
 - AB minus DE



LO4 Breakeven Analysis

E 8. Techno Designs produces head covers for golf clubs. The company expects to generate a profit next year. It anticipates fixed manufacturing costs of \$126,500 and fixed general and administrative expenses of \$82,030 for the year. Variable manufacturing and selling costs per set of head covers will be \$4.65 and \$2.75, respectively. Each set will sell for \$13.40.

1. Compute the breakeven point in sales units.
2. Compute the breakeven point in sales dollars.
3. If the selling price is increased to \$14 per unit and fixed general and administrative expenses are cut by \$33,465, what will the new breakeven point be in units?
4. Prepare a graph to illustrate the breakeven point computed in 2.

LO4 LO5 Breakeven Analysis and Pricing

E 9. McLennon Company has a plant capacity of 100,000 units per year, but its budget for this year indicates that only 60,000 units will be produced and sold. The entire budget for this year is as follows:

Sales (60,000 units at \$4)		\$240,000
Less cost of goods produced (based on production of 60,000 units)		
Direct materials (variable)	\$60,000	
Direct labor (variable)	30,000	
Variable overhead costs	45,000	
Fixed overhead costs	<u>75,000</u>	
Total cost of goods produced		<u>210,000</u>
Gross margin		\$ 30,000
Less selling and administrative expenses		
Selling (fixed)	\$24,000	
Administrative (fixed)	<u>36,000</u>	
Total selling and administrative expenses		<u>60,000</u>
Operating income (loss)		<u><u>(\$ 30,000)</u></u>

1. Given the budgeted selling price and cost data, how many units would McLennon have to sell to break even? (**Hint:** Be sure to consider selling and administrative expenses.)
2. Market research indicates that if McLennon were to drop its selling price to \$3.80 per unit, it could sell 100,000 units. Would you recommend the drop in price? What would the new operating income or loss be?

LO4 Breakeven Point for Multiple Products

E 10. Saline Aquarium, Inc., manufactures and sells aquariums, water pumps, and air filters. The sales mix is 1:2:2 (i.e., for every one aquarium sold, two water pumps and two air filters are sold). Using the contribution margin approach, find the breakeven point in units for each product. The company's fixed costs are \$26,000. Other information is as follows:

	Selling Price per Unit	Variable Costs per Unit
Aquariums	\$60	\$25
Water pumps	20	12
Air filters	10	3

L04 Breakeven Point for Multiple Products

E 11. Hamburgers and More, Inc., sells hamburgers, drinks, and fries. The sales mix is 1:3:2 (i.e., for every one hamburger sold, three drinks and two fries are sold). Using the contribution margin approach, find the breakeven point in units for each product. The company's fixed costs are \$2,040. Other information is as follows:

	Selling Price per Unit	Variable Costs per Unit
Hamburgers	\$0.99	\$0.27
Drinks	0.99	0.09
Fries	0.99	0.15

L04 Sales Mix Analysis

E 12. Ella Mae Simpson is the owner of a hairdressing salon in Palm Coast, Florida. Her salon provides three basic services: shampoo and set, permanents, and cut and blow dry. The following are its operating results from the past quarter:

Type of Service	Number of Customers	Total Sales	Contribution Margin in Dollars
Shampoo and set	1,200	\$24,000	\$14,700
Permanents	420	21,000	15,120
Cut and blow dry	<u>1,000</u>	<u>15,000</u>	<u>10,000</u>
	<u>2,620</u>	<u>\$60,000</u>	<u>\$39,820</u>
Total fixed costs			<u>30,000</u>
Profit			<u>\$ 9,820</u>

Compute the breakeven point in units based on the weighted-average contribution margin for the sales mix.

L04 L05 Contribution Margin and Profit Planning

E 13. Target Systems, Inc., makes heat-seeking missiles. It has recently been offered a government contract from which it may realize a profit. The contract purchase price is \$130,000 per missile, but the number of units to be purchased has not yet been decided. The company's fixed costs are budgeted at \$3,973,500, and variable costs are \$68,500 per unit.

1. Compute the number of units the company should agree to make at the stated contract price to earn a profit of \$1,500,000.
2. Using a lighter material, the variable unit cost can be reduced by \$1,730, but total fixed overhead will increase by \$27,500. How many units must be produced to make \$1,500,000 in profit?
3. Given the figures in 2, how many additional units must be produced to increase profit by \$1,264,600?

L05 Planning Future Sales

E 14. Short-term automobile rentals are the specialty of ASAP Auto Rentals, Inc. Average variable operating costs have been \$12.50 per day per automobile. The company owns 60 automobiles. Fixed operating costs for the next year are expected to be \$145,500. Average daily rental revenue per automobile is expected to be \$34.50. Management would like to earn a profit of \$47,000 during the year.

1. Calculate the total number of daily rentals the company must have during the year to earn the targeted profit.
2. On the basis of your answer to 1, determine the average number of days each automobile must be rented.

- Determine the total revenue needed to achieve the targeted profit of \$47,000.
- What would the total rental revenue be if fixed operating costs could be lowered by \$5,180 and the targeted profit increased to \$70,000?

L02 L05 Cost Behavior in a Service Business

E 15. Luke Ricci, CPA, is the owner of a firm that provides tax services. The firm charges \$50 per return for the direct professional labor involved in preparing standard short-form tax returns. In January, the firm prepared 850 such returns; in February, 1,000; and in March, 700. Service overhead (telephone and utilities, depreciation on equipment and building, tax forms, office supplies, and wages of clerical personnel) for January was \$18,500; for February, \$20,000; and for March, \$17,000.

- Determine the variable and fixed cost components of the firm's Service Overhead account.
- What would the estimated total cost per tax return be if the firm prepares 825 standard short-form tax returns in April?

L05 C-V-P Analysis in a Service Business

E 16. Flossmoor Inspection Service specializes in inspecting cars that have been returned to automobile leasing companies at the end of their leases. Flossmoor's charge for each inspection is \$50; its average cost per inspection is \$15. Tony Lomangeno, Flossmoor's owner, wants to expand his business by hiring another employee and purchasing an automobile. The fixed costs of the new employee and automobile would be \$3,000 per month. How many inspections per month would the new employee have to perform to earn Lomangeno a profit of \$1,200?

Problems

L01 L02 Cost Behavior and Projection for a Service Business

L05 P 1. Power Brite Painting Company specializes in refurbishing exterior painted surfaces that have been hard hit by humidity and insect debris. It uses a special technique, called pressure cleaning, before priming and painting the surface. The refurbishing process involves the following steps:

- Unskilled laborers trim all trees and bushes within two feet of the structure.
- Skilled laborers clean the building with a high-pressure cleaning machine, using about 6 gallons of chlorine per job.
- Unskilled laborers apply a coat of primer.
- Skilled laborers apply oil-based exterior paint to the entire surface.

On average, skilled laborers work 12 hours per job, and unskilled laborers work 8 hours. The refurbishing process generated the following operating results during the year on 628 jobs:

Skilled labor	\$20 per hour
Unskilled labor	\$8 per hour
Gallons of chlorine used	3,768 gallons at \$5.50 per gallon
Paint primer	7,536 gallons at \$15.50 per gallon
Paint	6,280 gallons at \$16 per gallon
Depreciation of paint-spraying equipment	\$600 per month depreciation
Lease of two vans	\$800 per month total
Rent on storage building	\$450 per month

Data on utilities for the year are as follows:

Month	Number of Jobs	Cost	Hours Worked
January	42	\$ 3,950	840
February	37	3,550	740
March	44	4,090	880
April	49	4,410	980
May	54	4,720	1,080
June	62	5,240	1,240
July	71	5,820	1,420
August	73	5,890	1,460
September	63	5,370	1,260
October	48	4,340	960
November	45	4,210	900
December	40	3,830	800
Totals	<u>628</u>	<u>\$55,420</u>	<u>12,560</u>

Required

1. Classify the costs as variable, fixed, or mixed.
2. Using the high-low method, separate mixed costs into their variable and fixed components. Use total hours worked as the basis.
3. Compute the average cost per job for the year. (**Hint:** Divide the total of all costs for the year by the number of jobs completed.)
4. Project the average cost per job for next year if variable costs per job increase 20 percent.
5. Why can actual utility costs vary from the amount computed using the utilities cost formula (requirement 2)?

Manager insight ►

L04 L05 Breakeven Analysis

P2. Luce & Morgan, a law firm in downtown Jefferson City, is considering opening a legal clinic for middle- and low-income clients. The clinic would bill at a rate of \$18 per hour. It would employ law students as paraprofessional help and pay them \$9 per hour. Other variable costs are anticipated to be \$5.40 per hour, and annual fixed costs are expected to total \$27,000.

Required

1. Compute the breakeven point in billable hours.
2. Compute the breakeven point in total billings.
3. Find the new breakeven point in total billings if fixed costs should go up by \$2,340.
4. Using the original figures, compute the breakeven point in total billings if the billing rate decreases by \$1 per hour, variable costs decrease by \$0.40 per hour, and fixed costs go down by \$3,600.

L04 L05 Planning Future Sales: Contribution Margin Approach

P3. Icon Industries is considering a new product for its Trophy Division. The product, which would feature an alligator, is expected to have global market appeal and to become the mascot for many high school and university athletic teams. Expected variable unit costs are as follows: direct materials, \$18.50; direct labor, \$4.25; production supplies, \$1.10; selling costs, \$2.80; and other, \$1.95. Annual fixed costs are depreciation, building, and equipment, \$36,000; advertising, \$45,000; and other, \$11,400. Icon Industries plans to sell the product for \$55.00.

Required

1. Using the contribution margin approach, compute the number of units the company must sell to (a) break even and (b) earn a profit of \$70,224.

Manager insight ►

2. Using the same data, compute the number of units that must be sold to earn a profit of \$139,520 if advertising costs rise by \$40,000.
3. Using the original information and sales of 10,000 units, compute the selling price the company must use to make a profit of \$131,600. (**Hint:** Calculate contribution margin per unit first.)
4. According to the vice president of marketing, Albert Flora, the most optimistic annual sales estimate for the product would be 15,000 units, and the highest competitive selling price the company can charge is \$52 per unit. How much more can be spent on fixed advertising costs if the selling price is \$52, if the variable costs cannot be reduced, and if the targeted profit for 15,000 unit sales is \$251,000?

L04 L05 Breakeven Analysis and Planning Future Sales

P 4. Write Company has a maximum capacity of 200,000 units per year. Variable manufacturing costs are \$12 per unit. Fixed overhead is \$600,000 per year. Variable selling and administrative costs are \$5 per unit, and fixed selling and administrative costs are \$300,000 per year. The current sales price is \$23 per unit.

Required

1. What is the breakeven point in (a) sales units and (b) sales dollars?
2. How many units must Write Company sell to earn a profit of \$240,000 per year?
3. A strike at one of the company's major suppliers has caused a shortage of materials, so the current year's production and sales are limited to 160,000 units. To partially offset the effect of the reduced sales on profit, management is planning to reduce fixed costs to \$841,000. Variable cost per unit is the same as last year. The company has already sold 30,000 units at the regular selling price of \$23 per unit.
 - a. What amount of fixed costs was covered by the total contribution margin of the first 30,000 units sold?
 - b. What contribution margin per unit will be needed on the remaining 130,000 units to cover the remaining fixed costs and to earn a profit of \$210,000 this year?

L04 L05 Planning Future Sales for a Service Business

P 5. Lending Hand Financial Corporation is a subsidiary of Gracey Enterprises. Its main business is processing loan applications. Last year, Bettina Brent, the manager of the corporation's loan department, established a policy of charging a \$250 fee for every loan application processed. Next year's variable costs have been projected as follows: loan consultant's wages, \$15.50 per hour (a loan application takes 5 hours to process); supplies, \$2.40 per application; and other variable costs, \$5.60 per application. Annual fixed costs include depreciation of equipment, \$8,500; building rental, \$14,000; promotional costs, \$12,500; and other fixed costs, \$8,099.

Required

1. Using the contribution margin approach, compute the number of loan applications the company must process to (a) break even and (b) earn a profit of \$14,476.
2. Using the same approach and assuming promotional costs increase by \$5,662, compute the number of applications the company must process to earn a profit of \$20,000.
3. Assuming the original information and the processing of 500 applications, compute the loan application fee the company must charge if the targeted profit is \$41,651.

- Manager insight** ▶ 4. Brent's staff can handle a maximum of 750 loan applications. How much more can be spent on promotional costs if the highest fee tolerable to the customer is \$280, if variable costs cannot be reduced, and if the targeted profit for the loan applications is \$50,000?

Alternate Problems

LO1 LO2 Mixed Costs

LO5 P 6. Officials of the Hidden Hills Golf and Tennis Club are in the process of preparing a budget for the year ending December 31. Because Ramon Saud, the club treasurer, has had difficulty with two expense items, the process has been delayed by more than four weeks. The two items are mixed costs—expenses for electricity and for repairs and maintenance—and Saud has been having trouble breaking them down into their variable and fixed components.

An accountant friend has suggested that he use the high-low method to divide the costs into their variable and fixed parts. The spending patterns and activity measures related to each cost during the past year are as follows:

Month	Electricity Expense		Repairs and Maintenance	
	Amount	Kilowatt-Hours	Amount	Labor Hours
January	\$ 7,500	210,000	\$ 7,578	220
February	8,255	240,200	7,852	230
March	8,165	236,600	7,304	210
April	8,960	268,400	7,030	200
May	7,520	210,800	7,852	230
June	7,025	191,000	8,126	240
July	6,970	188,800	8,400	250
August	6,990	189,600	8,674	260
September	7,055	192,200	8,948	270
October	7,135	195,400	8,674	260
November	8,560	252,400	8,126	240
December	8,415	246,600	7,852	230
Totals	<u>\$92,550</u>	<u>2,622,000</u>	<u>\$96,416</u>	<u>2,840</u>

Required

- Using the high-low method, compute the variable cost rates used last year for each expense. What was the monthly fixed cost for electricity and for repairs and maintenance?
- Compute the total variable cost and total fixed cost for each expense category for last year.
- Saud believes that in the coming year, the electricity rate will increase by \$0.005 and the repairs rate, by \$1.20. Usage of all items and their fixed cost amounts will remain constant. Compute the projected total cost for each category. How will the cost increases affect the club's profits and cash flow?

LO4 LO5 Breakeven Analysis

P 7. At the beginning of each year, the Accounting Department at Moon Glow Lighting, Ltd., must find the point at which projected sales revenue will equal total budgeted variable and fixed costs. The company produces custom-made, low-voltage outdoor lighting systems. Each system sells for an average of \$435. Variable costs per unit are \$210. Total fixed costs for the year are estimated to be \$166,500.

Required

1. Compute the breakeven point in sales units.
2. Compute the breakeven point in sales dollars.
3. Find the new breakeven point in sales units if the fixed costs go up by \$10,125.
4. Using the original figures, compute the breakeven point in sales units if the selling price decreases to \$425 per unit, fixed costs go up by \$15,200, and variable costs decrease by \$15 per unit.

LO4 LO5 Planning Future Sales: Contribution Margin Approach

P 8. Garden Marbles manufactures birdbaths, statues, and other decorative items, which it sells to florists and retail home and garden centers. Its design department has proposed a new product, a statue of a frog, that it believes will be popular with home gardeners. Expected variable unit costs are direct materials, \$9.25; direct labor, \$4.00; production supplies, \$0.55; selling costs, \$2.40; and other, \$3.05. The following are fixed costs: depreciation, building, and equipment, \$33,000; advertising, \$40,000; and other, \$6,000. Management plans to sell the product for \$29.25.

Required

1. Using the contribution margin approach, compute the number of statues the company must sell to (a) break even and (b) earn a profit of \$50,000.
2. Using the same data, compute the number of statues that must be sold to earn a profit of \$70,000 if advertising costs rise by \$20,000.
3. Using the original data and sales of 15,000 units, compute the selling price the company must charge to make a profit of \$100,000.
4. According to the vice president of marketing, Yvonne Palmer, if the price of the statues is reduced and advertising is increased, the most optimistic annual sales estimate is 25,000 units. How much more can be spent on fixed advertising costs if the selling price is reduced to \$28.00 per statue, if the variable costs cannot be reduced, and if the targeted profit for sales of 25,000 statues is \$120,000?

Manager insight ►

LO4 LO5 Breakeven Analysis and Planning Future Sales

P 9. Peerless Company has a maximum capacity of 500,000 units per year. Variable manufacturing costs are \$25 per unit. Fixed overhead is \$900,000 per year. Variable selling and administrative costs are \$5 per unit, and fixed selling and administrative costs are \$300,000 per year. The current sales price is \$36 per unit.

Required

1. What is the breakeven point in (a) sales units and (b) sales dollars?
2. How many units must Peerless Company sell to earn a profit of \$600,000 per year?
3. A strike at one of the company's major suppliers has caused a shortage of materials, so the current year's production and sales are limited to 400,000 units. To partially offset the effect of the reduced sales on profit, management is planning to reduce fixed costs to \$1,000,000. Variable cost per unit is the same as last year. The company has already sold 30,000 units at the regular selling price of \$36 per unit.
 - a. What amount of fixed costs was covered by the total contribution margin of the first 30,000 units sold?
 - b. What contribution margin per unit will be needed on the remaining 370,000 units to cover the remaining fixed costs and to earn a profit of \$300,000 this year?

LO5 Planning Future Sales for a Service Business

P 10. Home Mortgage Inc.'s primary business is processing mortgage loan applications. Last year, Jenna Jason, the manager of the mortgage application department, established a policy of charging a \$500 fee for every loan application processed. Next year's variable costs have been projected as follows: mortgage processor wages, \$30 per hour (a mortgage application takes 3 hours to process); supplies, \$10 per application; and other variable costs, \$15 per application. Annual fixed costs include depreciation of equipment, \$5,000; building rental, \$34,000; promotional costs, \$45,000; and other fixed costs, \$20,000.

Required

1. Using the contribution margin approach, compute the number of loan applications the company must process to (a) break even and (b) earn a profit of \$50,000.
2. Using the same approach and assuming promotional costs increase by \$5,400, compute the number of applications the company must process to earn a profit of \$60,000.
3. Assuming the original information and the processing of 500 applications, compute the loan application fee the company must charge if the targeted profit is \$40,000.
4. Jason's staff can handle a maximum of 750 loan applications. How much more can be spent on promotional costs if the highest fee tolerable to the customer is \$400, if variable costs cannot be reduced, and if the targeted profit for the loan applications is \$50,000?

Manager insight ►

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO4 Breaking Even and Ethics

C 1. Lesley Chomski is the supervisor of the New Product Division of MCO Corporation. Her annual bonus is based on the success of new products and is computed on the number of sales that exceed each new product's projected breakeven point. In reviewing the computations supporting her most recent bonus, Chomski found that although an order for 7,500 units of a new product called R56 had been refused by a customer and returned to the company, the order had been included in the bonus calculations. She later discovered that the company's accountant had labeled the return an overhead expense and had charged the entire cost of the returned order to the plantwide Overhead account. The result was that product R56 appeared to exceed breakeven by more than 5,000 units and Chomski's bonus from this product amounted to over \$1,000. What actions should Chomski take? Be prepared to discuss your response in class.

LO1 LO4 Cost Behavior and Contribution Margin

C 2. Visit a local fast-food restaurant. Observe all aspects of the operation and take notes on the entire process. Describe the procedures used to take, process, and fill an order and deliver the order to the customer. Based on your observations, make a list of the costs incurred by the operation. Identify at least three variable costs and three fixed costs. Can you identify any potential mixed costs? Why is the restaurant willing to sell a large drink for only a few cents more than a medium drink? How is the restaurant able to offer a "value meal" (e.g., sandwich, drink, and fries) for considerably less than those items would cost if they were bought separately? Bring your notes to class and be prepared to discuss your findings.

Your instructor will divide the class into groups to discuss the case. Summarize your group's discussion, and ask one member of the group to present the summary to the rest of the class.

L03 L04 C-V-P Analysis

C3. Based in Italy, Datura, Ltd., is an international importer-exporter of pottery with distribution centers in the United States, Europe, and Australia. The company was very successful in its early years, but its profitability has since declined. As a member of a management team selected to gather information for Datura's next strategic planning meeting, you have been asked to review its most recent contribution margin income statement for the year ended December 31, 2010, which appears below.

Datura, Ltd.		
Contribution Margin Income Statement		
For the Year Ended December 31, 2010		
Sales revenue		€13,500,000
Less variable costs		
Purchases	€6,000,000	
Distribution	2,115,000	
Sales commissions	1,410,000	
Total variable costs		<u>9,525,000</u>
Contribution margin		€ 3,975,000
Less fixed costs		
Distribution	€ 985,000	
Selling	1,184,000	
General and administrative	871,875	
Total fixed costs		<u>3,040,875</u>
Operating income		<u>€ 934,125</u>

In 2010, Datura sold 15,000 sets of pottery.

- For each set of pottery sold in 2010, calculate the (a) selling price, (b) variable purchases cost, (c) variable distribution cost, (d) variable sales commission, and (e) contribution margin.
- Calculate the breakeven point in units and in sales euros.
- Historically, Datura's variable costs have been about 60 percent of sales. What was the ratio of variable costs to sales in 2010? List three actions Datura could take to correct the difference.
- How would fixed costs have been affected if Datura had sold only 14,000 sets of pottery in 2010?

L05 C-V-P Analysis Applied

C4. Refer to the information in **C3**. In January 2011, Sophia Callas, the president of Datura, Ltd., conducted a strategic planning meeting. During the meeting, Phillippe Mazzeo, vice president of distribution, noted that because of a new contract with an international shipping line, the company's fixed distribution costs for 2011 would be reduced by 10 percent and its variable distribution costs by 4 percent. Gino Roma, vice president of sales, offered the following information:

We plan to sell 15,000 sets of pottery again in 2011, but based on review of the competition, we are going to lower the selling price to €890 per set. To encourage increased sales, we will raise sales commissions to 12 percent of the selling price.

Sophia Callas is concerned that the changes described by Roma and Mazzeo may not improve operating income sufficiently in 2011. If operating income does not increase by at least 10 percent, she will want to find other ways to reduce the company's costs. She asks you to evaluate the situation in a written report. Because it is already January of 2011 and changes need to be made quickly, she requests your report within five days.

1. Prepare a budgeted contribution margin income statement for 2011. Your report should show the budgeted (estimated) operating income based on the information provided above and in **C 3**. Will the changes improve operating income sufficiently? Explain.
2. In preparation for writing your report, answer the following questions:
 - a. Why are you preparing the report?
 - b. Who needs the report?
 - c. What sources of information will you use?
 - d. When is the report due?

L05 Planning Future Sales

C 5. As noted in **C 3**, Datura, Ltd., sold 15,000 sets of pottery in 2010. As noted in **C 4**, in 2011, Datura's strategic planning team targeted sales of 15,000 sets of pottery, reduced the selling price to €890 per set, increased sales commissions to 12 percent of the selling price, and decreased fixed distribution costs by 10 percent and variable distribution costs by 4 percent. It was assumed that all other costs would stay the same.

Based on an analysis of these changes, Sophia Callas, Datura's president, is concerned that the proposed strategic plan will not meet her goal of increasing Datura's operating income by 10 percent over last year's income and that the operating income will be less than last year's income. She has come to you for spreadsheet analysis of the proposed strategic plan and for analysis of a special order she just received from an Australian distributor for 4,500 sets of pottery. The order's selling price, variable purchases cost per unit, sales commission, and total fixed costs will be the same as for the rest of the business, but the variable distribution costs will be €160 per unit.

Using an Excel spreadsheet, complete the following tasks:

1. Calculate the targeted operating income for 2011 using just the proposed strategic plan.
2. Prepare a budgeted contribution margin income statement for 2011 based on just the strategic plan. Do you agree with Datura's president that the company's projected operating income for 2011 will be less than the operating income for 2010? Explain your answer.
3. Calculate the total contribution margin from the Australian sales.
4. Prepare a revised budgeted contribution margin income statement for 2011 that includes the Australian order. (**Hint:** Combine the information from **2** and **3** above.)
5. Does Datura need the Australian sales to achieve its targeted operating income for 2011?

L01 L02 Cookie Company (Continuing Case)

C 6. In this segment of our continuing "cookie company" case, you will classify the costs of the business as variable, fixed, or mixed; use the high-low method to evaluate utility costs; and prepare a contribution margin income statement.

1. Review your cookie recipe and the overhead costs you identified in Chapter 16, and classify the costs as variable, fixed, or mixed costs.

2. Obtain your electric bills for three months, and use the high-low method's cost formula to determine the monthly cost of electricity—that is, monthly electric cost = variable rate per kilowatt-hour + monthly fixed cost. If you do not receive an electric bill, use the following information:

Month	Kilowatt-Hours Used	Electric Costs
August	1,439	\$202
September	1,866	230
October	1,146	158

3. Prepare a daily contribution margin income statement based on the following assumptions:

Cookie Company makes only one kind of cookie and sells it for \$1.00 per unit. The company projects sales of 500 units per day. Projected daily costs are as follows:

Type of Cost	Manufacturing	Nonmanufacturing
Variable	\$100	\$50
Nonvariable	120	60

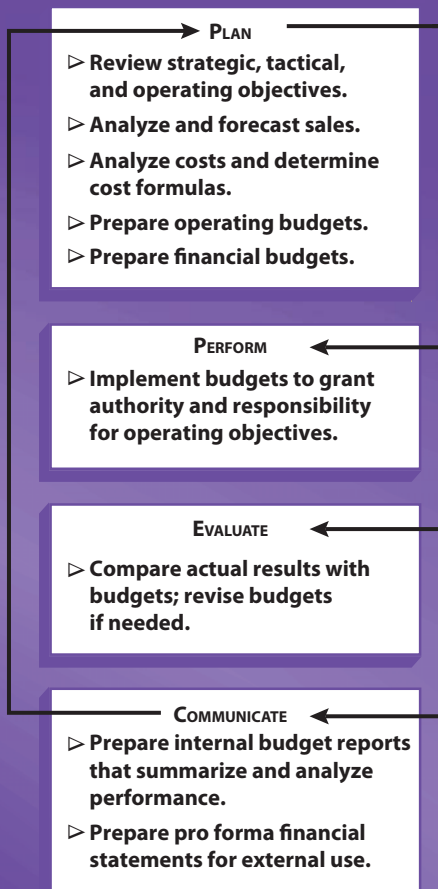
- What is the contribution margin ratio?
- What volume, in terms of units, must the company sell to break even each day?

CHAPTER

7

The Budgeting Process

The Management Process



Budgeting is not only an essential part of planning; it also helps managers control, evaluate, and report on operations.

When managers develop budgets, they match their organizational goals with the resources necessary to accomplish those goals. During the budgeting process, they evaluate operational, tactical, value chain, and capacity issues; assess how resources can be used efficiently; and develop contingency budgets as business conditions change. In this chapter, we describe the budgeting process, identify the elements of a master budget, and demonstrate how managers prepare operating budgets and financial budgets.

LEARNING OBJECTIVES

- LO1** Define *budgeting*, and explain budget basics. (pp. 280–283)
- LO2** Identify the elements of a master budget in different types of organizations and the guidelines for preparing budgets. (pp. 283–287)
- LO3** Prepare the operating budgets that support the financial budgets. (pp. 287–294)
- LO4** Prepare a budgeted income statement, a cash budget, and a budgeted balance sheet. (pp. 295–301)

DECISION POINT ► A MANAGER'S FOCUS FRAMERICA CORPORATION

Framerica Corporation is one of the leading manufacturers of picture frames in North America. Its innovations, which include profile-wrapping capabilities and finishes, have revolutionized the methods used in producing picture frames. Because Framerica believes its work force is its most valuable asset, one of its priorities is to help employees attain their personal goals.

One highly effective way of achieving congruence between a company's goals and objectives and employees' personal aspirations is a participative budgeting process—an ongoing dialogue that involves personnel at all levels of a company in making budgeting decisions. This dialogue provides both managers and lower-level employees with insight into the company's current activities and future direction and motivates them to improve their own performance, which, in turn, improves the company's performance.

- How does Framerica Corporation translate long-term goals into operating objectives?
- What is the effect of Framerica's budgeting process?



The Budgeting Process

LO1 Define *budgeting*, and explain budget basics.

Study Note

For-profit organizations often use the term *profit planning* rather than *budgeting*.

Budgeting is the process of identifying, gathering, summarizing, and communicating financial and nonfinancial information about an organization's future activities. It is an essential part of the continuous planning that an organization must do to accomplish its long-term goals. The budgeting process provides managers of all types of organizations—including for-profit organizations and not-for-profit organizations—the opportunity to match their organizational goals with the resources necessary to accomplish those goals.

Budgets—plans of action based on forecasted transactions, activities, and events—are synonymous with managing an organization. They are essential to accomplishing the goals articulated in an organization's strategic plan. They are used to communicate information, coordinate activities and resource usage, motivate employees, and evaluate performance. For example, a board of directors may use budgets to determine managers' areas of responsibility and to measure managers' performance in those areas.

Budgets are, of course, also used to manage and account for cash. Such budgets establish targeted levels of cash receipts and limits on the spending of cash for particular purposes.

Advantages of Budgeting

Budgeting is advantageous for organizations, because:

1. Budgets foster organizational communication.
2. Budgets ensure a focus both on future events and on resolving day-to-day issues.
3. Budgets assign resources and the responsibility to use them wisely to managers who are held accountable for their results.
4. Budgets can identify potential constraints before they become problems.
5. Budgets facilitate congruence between organizational and personal goals.
6. Budgets define organizational goals and objectives numerically, against which actual performance results can be evaluated.



FOCUS ON BUSINESS PRACTICE

What Can Cause the Planning Process to Fail?

When chief financial officers were asked what caused their planning process to fail, these were the six factors they most commonly cited:¹

- ▶ An inadequately defined strategy
- ▶ No clear link between strategy and the operational budget
- ▶ Lack of individual accountability for results
- ▶ Lack of meaningful performance measures
- ▶ Inadequate pay for performance
- ▶ Lack of appropriate data

Budgeting and Goals

Long-Term Goals **Strategic planning** is the process by which management establishes an organization's long-term goals. These goals define the strategic direction that an organization will take over a ten-year period and are the basis for making annual operating plans and preparing budgets. Long-term goals cannot be vague; they must set specific tactical targets and timetables and assign operating responsibility for achieving the goals to specific personnel. For example, a long-term goal for a company that currently holds only 4 percent of its product's market share might specify that the vice president of marketing is to develop strategies to ensure that the company controls 10 percent of the market in five years and 15 percent by the end of ten years.

Study Note

As plans are formulated for time periods closer to the current date, they become more specific and quantified. The annual budget is a very specific plan of action.

Short-Term Goals Annual operating plans involve every part of an enterprise and are much more detailed than long-term strategic plans. To formulate an annual operating plan, an organization must restate its long-term goals in terms of what it needs to accomplish during the next year. The process entails making decisions about sales and profit targets, human resource needs, and the introduction of new products or services. The short-term goals identified in an annual operating plan are the basis of an organization's operating budgets for the year.

Budgeting Basics

Once long- and short-term goals have been decided, the organization's controller and **budget committee**, which includes many top managers, play a central role in coordinating the budgeting process. Together, they set the basics of the budgeting process, including assigning budget authority, inviting employee participation, selecting the budget period, and implementing the budget.

Budget Authority Every budget and budget line item is associated with a specific role or job in an organization. For example, a department manager is responsible for the department's budget, and the marketing vice president is responsible for what is spent on advertising.

Since managers responsibilities and budget authority are linked, managers must explain or take corrective action for any deviations between their budgets and actual results. Responsibility accounting, which will be discussed in greater detail in the next chapter, authorizes managers to take control of and be held accountable for the revenues and expenses in their budgets. It assigns resources and the responsibility to use them wisely to managers. If managers do not have budget authority, they lack the control necessary to accomplish their duties and cannot be held accountable for results. The concept of responsibility accounting holds managers accountable for only those budget items that they actually control.

Participation Because an organization's main activities—such as production, sales, and employee training—take place at its lower levels, the information necessary for establishing a budget flows from the employees and supervisors of those activities through middle managers to senior executives. Each person in this chain of communication thus plays a role in developing a budget, as well as in implementing it. If these individuals feel that they have a voice in setting the budget targets, they will be motivated to ensure that their departments attain those targets and stay within the budget. If they do not feel that they have a role in the budgeting process, motivation will suffer. The key to a successful

budget is therefore **participative budgeting**, a process in which personnel at all levels of an organization actively engage in making decisions about the budget. Participative budgeting depends on joint decision making; without it the budgeting process will be authoritative rather than participative. Without input from personnel at all operational levels, the budget targets may be unrealistic and impossible to attain.

Budget Period Budgets, like the company's fiscal period, generally cover a one-year period of time. An annual operating budget may be divided further by an organization into monthly or quarterly periods depending on how detailed the information needs are. In this chapter, you will be working with both monthly and quarterly budgets.

The organization's controller and budget committee decide whether they will use a static or continuous budgeting process. **Static budgets** are prepared once a year and do not change during the annual budget period. To ensure that its managers have continuously updated operating data against which to measure performance, an organization may select an ongoing budgeting process, called a continuous budget. A **continuous budget** is a forward-rolling budget that summarizes budgets for the next 12 months. Each month, managers prepare a budget for the same month next year. Thus, the budget is continuously reviewed and revised during the year.

Budget Approach Traditional budgeting approaches require managers to justify only budget changes over the past year. An alternative to traditional budgeting is zero-based budgeting. **Zero-based budgeting** requires that every budget item be justified annually, not just the changes. So each year the budget is built from scratch.

Budget Implementation The budget committee and the controller have overall responsibility for budget implementation. The budget committee oversees each stage in the preparation of the organization's overall budget, mediates any departmental disputes that may arise in the process, and gives final approval to the budget. The makeup of the committee ensures that the budgeting process has a companywide perspective.

A budget may have to go through many revisions before it includes all planning decisions and has the approval of the budget committee. Once the committee approves the budget, periodic reports from department managers allow the committee to monitor the company's progress in attaining budget targets.

Successful budget implementation depends on two factors—clear communication and the support of top management. To ensure their cooperation in implementing the budget, all key persons involved must know what roles they are expected to play and must have specific directions on how to achieve their performance goals. Thus, the controller and other members of the budget committee must be very clear in communicating performance expectations and budget targets. Equally important, top management must show support for the budget and encourage its implementation. The process will succeed only if middle- and lower-level managers are confident that top management is truly interested in the outcome and is willing to reward personnel for meeting the budget targets. Today, many organizations have employee incentive plans that tie the achievement of budget targets to bonuses or other types of compensation.

Study Note

Because good communication can eliminate many of the problems that typically arise in the budgeting process, company-wide dialogue is extremely important.

STOP & APPLY >

Randi Quelle is the manager of the electronics department in a large discount store. During a recent meeting, Quelle and her supervisor agreed that Quelle's goal for the next year would be to increase by 20 percent the number of flat-screen televisions sold. The department sold 500 TV sets last year. Two sales persons currently work for Quelle. What types of budgets should Quelle use to help her achieve her sales goal? What kinds of information should those budgets provide?

SOLUTION

Budgets and information that might be useful include:

1. Breakdown by month of last year's sales to use as a guide to build this year's monthly targets. This would include seasonal sales information.
2. Budgets by sales person, which may indicate a need for a third sales person.
3. Inventory and purchasing information.
4. Budgets of sales promotion and advertising.
5. Information on customer flow and the best times to sell.

The Master Budget

LO2 Identify the elements of a master budget in different types of organizations and the guidelines for preparing budgets.

Study Note

Budgeted financial statements are often referred to as *forecasted financial statements*, *pro forma financial statements*, or *forward-looking financial statements*.

A **master budget** consists of a set of operating budgets and a set of financial budgets that detail an organization's financial plans for a specific accounting period, generally a year. When a master budget covers an entire year, some of the operating and financial budgets may show planned results by month or by quarter.

- ▶ As the term implies, **operating budgets** are plans used in daily operations. They are also the basis for preparing the **financial budgets**, which are projections of financial results for the accounting period.
- ▶ Financial budgets include a budgeted income statement, a capital expenditures budget, a cash budget, and a budgeted balance sheet.

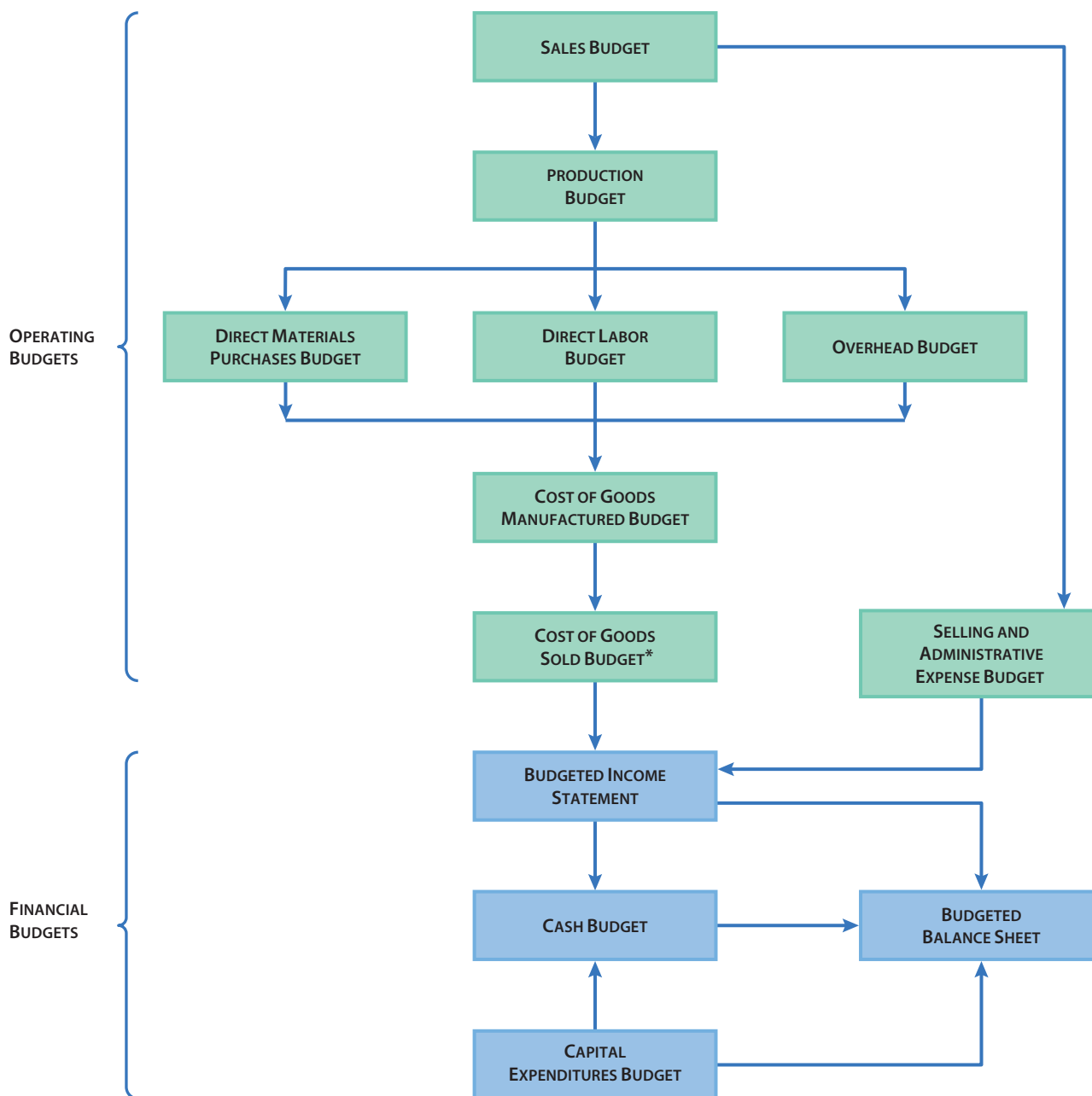
The budgeted financial statements—that is, the budgeted income statement and budgeted balance sheet—are also called **pro forma financial statements**, meaning that they show projections rather than actual results. Pro forma financial statements are often used to communicate business plans to external parties.

If, for example, you wanted to obtain a bank loan so that you could start a new business, you would have to present the bank with a pro forma, or budgeted, income statement and balance sheet showing that you could repay the loan with cash generated by profitable operations.

Preparation of a Master Budget

Suppose you have started your own business. Whether it is a manufacturing, retail, or service organization, to manage it effectively, you would prepare a master budget each period. A master budget provides the information needed to match long-term goals to short-term activities and to plan the resources needed to ensure an organization's profitability and liquidity.

Figures 7-1, 7-2, and 7-3 display the elements of a master budget for a manufacturing organization, a retail organization, and a service organization, respectively. As these illustrations indicate, the process of preparing a master budget is similar in all three types of organizations in that each prepares a set of

FIGURE 7-1 Preparation of a Master Budget for a Manufacturing Organization

*Some organizations choose to include the cost of goods sold budget in the budgeted income statement.

operating budgets that serve as the basis for preparing the financial budgets. The process differs mainly in the kinds of operating budgets that each type of organization prepares.

- ▶ The operating budgets of manufacturing organizations, such as **Framerica**, include budgets for sales, production, direct materials, direct labor, overhead, selling and administrative expenses, and cost of goods manufactured.
- ▶ Retail organizations, such as **Michaels**, **Talbots**, and **Lowe's**, prepare a sales budget, a purchases budget, a selling and administrative expense budget, and a cost of goods sold budget.

FIGURE 7-2
Preparation of a Master Budget
for a Retail Organization

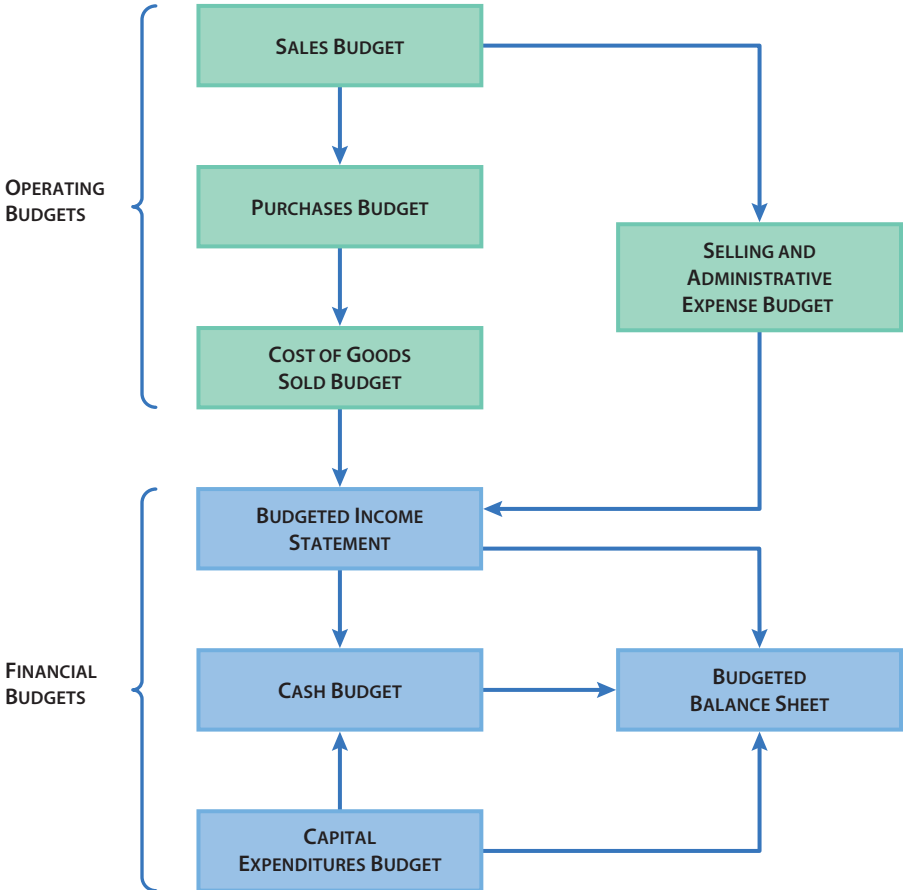
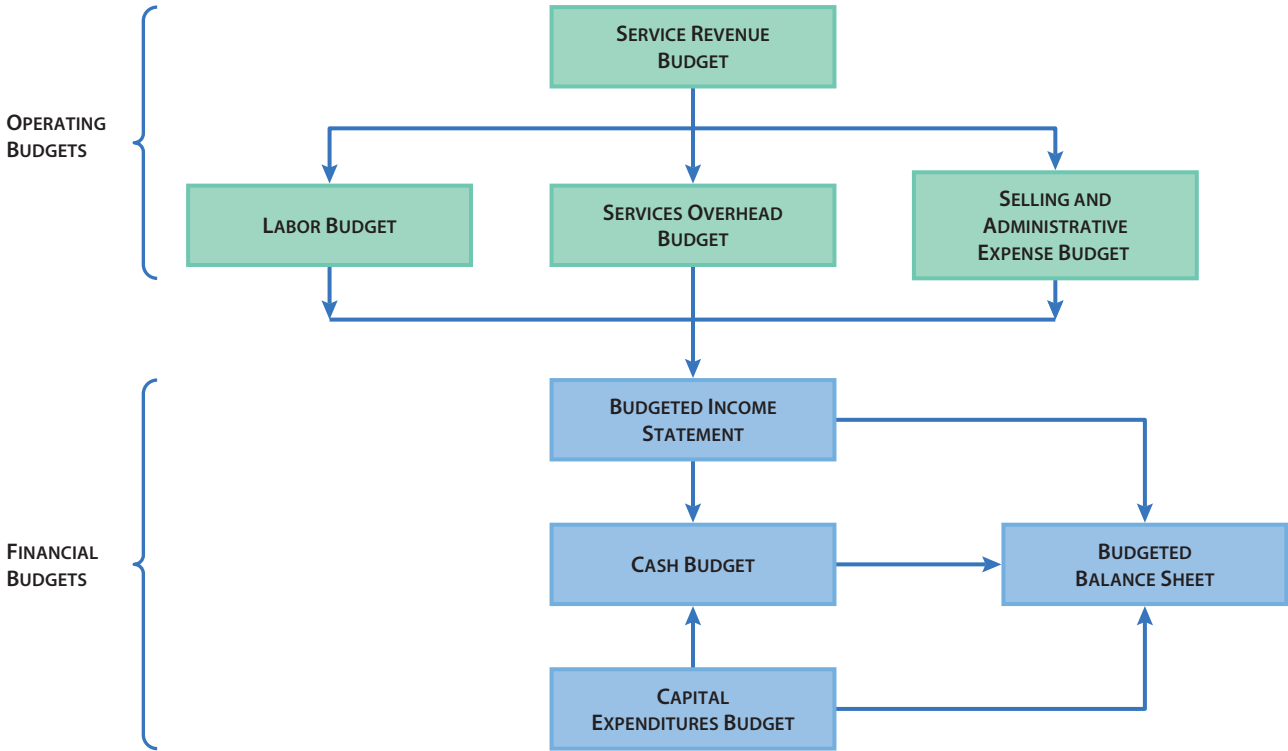


FIGURE 7-3 Preparation of a Master Budget for a Service Organization



- ▶ The operating budgets of service organizations, such as **Enterprise Rent-A-Car**, **UPS**, and **Amtrak**, include budgets for service revenue (sales), labor, services overhead, and selling and administrative expenses.

The sales budget (or in service organizations, the service revenue budget) is prepared first because it is used to estimate sales volume and revenues. Once managers know the quantity of products or services to be sold and how many sales dollars to expect, they can develop other budgets that will enable them to manage their organization's resources so that they generate profits on those sales.

For example, in a retail organization, the purchases budget provides managers with information about the quantity of merchandise needed to meet the sales demand and yet maintain a minimum level of inventory. In a service organization, the labor budget provides information about the labor hours and labor rates needed to provide services and generate the revenues planned for each period; managers use this information in scheduling services and setting prices.

Budget Procedures

Because procedures for preparing budgets vary from organization to organization, there is no standard format for budget preparation. The only universal requirement is that budgets communicate the appropriate information to the reader in a clear and understandable manner. By keeping that in mind and using the following guidelines, managers can improve the quality of budgets in any type of organization:

1. Know the purpose of the budget, and clearly identify who is responsible for carrying out the activities in the budget.
2. Identify the user group and its information needs.
3. Identify sources of accurate, meaningful budget information. Such information may be gathered from documents or from interviews with employees, suppliers, or managers who work in the related areas.
4. Establish a clear format for the budget. A budget should begin with a clearly stated heading that includes the organization's name, the type of budget, and the accounting period under consideration. The budget's components should be clearly labeled, and the unit and financial data should be listed in an orderly manner.
5. Use appropriate formulas and calculations in deriving the quantitative information.
6. Revise the budget until it includes all planning decisions. Several revisions may be required before the final version is ready for distribution.



STOP & APPLY >

Identify the order in which the following budgets are prepared:

- | | |
|--------------------------------------|------------------------------|
| 1. Overhead budget | 5. Sales budget |
| 2. Production budget | 6. Budgeted balance sheet |
| 3. Direct labor budget | 7. Cash budget |
| 4. Direct materials purchases budget | 8. Budgeted income statement |

(continued)

SOLUTION

1. Sales budget
2. Production budget
3. Direct materials purchases budget, direct labor budget, and overhead budget
4. Budgeted income statement
5. Cash budget
6. Budgeted balance sheet

Operating Budgets

LO3 Prepare the operating budgets that support the financial budgets.

Study Note

The sales budget is the only budget based on an estimate of customer demand. Other budgets for the period are prepared from it and are based on the numbers it provides.

Although procedures for preparing operating budgets vary, the tools used in the process do not. In this section, we use a frame-making company, called Framecraft Company, to illustrate how a manufacturing organization prepares its operating budgets. Because Framecraft Company makes only one product—a plastic picture frame—it prepares only one of each type of operating budget. Organizations that manufacture a variety of products or provide many types of services may prepare either separate operating budgets or one comprehensive budget for each product or service.

The Sales Budget

As we indicated earlier, the first step in preparing a master budget is to prepare a sales budget. A **sales budget** is a detailed plan, expressed in both units and dollars, that identifies the sales expected during an accounting period. Sales managers use this information to plan sales- and marketing-related activities and to determine their human, physical, and technical resource needs. Accountants use the information to determine estimated cash receipts for the cash budget.

The following equation is used to determine the total budgeted sales:

$$\begin{array}{rcc} \text{Total} & \text{Estimated} & \text{Estimated} \\ \text{Budgeted} & = & \text{Selling Price} \times \text{Sales in} \\ \text{Sales} & & \text{per Unit} \quad \text{Units} \end{array}$$

Although the calculation is easy, selecting the best estimates for the selling price per unit and the sales demand in units can be difficult.

- ▶ An estimated selling price below the current selling price may be needed if competitors are currently selling the same product or service at lower prices or if the organization wants to increase its share of the market.
- ▶ On the other hand, if the organization has improved the quality of its product or service by using more expensive materials or processes, the estimated selling price may have to be higher than the current price.

The estimated sales volume is very important because it will affect the level of operating activities and the amount of resources needed for operations. To help estimate sales volume, managers often use a **sales forecast**, which is a projection of sales demand (the estimated sales in units) based on an analysis of external and internal factors. The external factors include:

1. The state of the local and national economies
2. The state of the industry's economy
3. The nature of the competition and its sales volume and selling price

EXHIBIT 7-1
Sales Budget

Framecraft Company					
Sales Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Sales in units	10,000	30,000	10,000	40,000	90,000
× Selling price per unit	× \$5	× \$5	× \$5	× \$5	× \$5
Total sales	<u>\$50,000</u>	<u>\$150,000</u>	<u>\$50,000</u>	<u>\$200,000</u>	<u>\$450,000</u>

Internal factors taken into consideration in a sales forecast include:

1. The number of units sold in prior periods
2. The organization's credit policies
3. The organization's collection policies
4. The organization's pricing policies
5. Any new products that the organization plans to introduce to the market
6. The capacity of the organization's manufacturing facilities

Exhibit 7-1 illustrates Framecraft Company's sales budget for the year. The budget shows the estimated number of unit sales and dollar revenue amounts for each quarter and for the entire year. Because a sales forecast indicated a highly competitive marketplace, Framecraft's managers have estimated a selling price of \$5 per unit. The sales forecast also indicated highly seasonal sales activity; the estimated sales volume therefore varies from 10,000 to 40,000 per quarter.

The Production Budget

A **production budget** is a detailed plan showing the number of units that a company must produce to meet budgeted sales and inventory needs. Production managers use this information to plan for the materials and human resources that production-related activities will require. To prepare a production budget, managers must know the budgeted number of unit sales (which is specified in the sales budget) and the desired level of ending finished goods inventory for each period in the budget year. That level is often stated as a percentage of the next period's budgeted unit sales.

For example, Framecraft Company's desired level of ending finished goods inventory is 10 percent of the next quarter's budgeted unit sales. (Its desired level of beginning finished goods inventory is 10 percent of the current quarter's budgeted unit sales.)

The following formula identifies the production needs for each accounting period:

$$\begin{array}{rclcl}
 \text{Total} & & \text{Budgeted} & & \text{Desired Units of} & & \text{Desired Units of} \\
 \text{Production} & = & \text{Sales in} & + & \text{Ending Finished} & - & \text{Beginning} \\
 \text{Units} & & \text{Units} & & \text{Goods Inventory} & & \text{Finished Goods} \\
 & & & & & & \text{Inventory}
 \end{array}$$

Exhibit 7-2 shows Framecraft Company's production budget for the year. Notice that each quarter's desired total units of ending finished goods inventory become the next quarter's desired total units of beginning finished goods inventory.

EXHIBIT 7-2
Production Budget

	Quarter				Year
	1	2	3	4	
Sales in units	10,000	30,000	10,000	40,000	90,000
Plus desired units of ending finished goods inventory	3,000	1,000	4,000	1,500	1,500
Desired total units	13,000	31,000	14,000	41,500	91,500
Less desired units of beginning finished goods inventory	1,000	3,000	1,000	4,000	1,000
Total production units	12,000	28,000	13,000	37,500	90,500

- ▶ Because unit sales of 15,000 are budgeted for the first quarter of next year, the ending finished goods inventory for the fourth quarter of the year is 1,500 units ($0.10 \times 15,000$ units), which is the same as the desired number of units of ending finished goods inventory for the entire year.
- ▶ Similarly, the number of desired units for the first quarter's beginning finished goods inventory—1,000—is the same as the desired number of units of beginning finished goods inventory for the entire year.

The Direct Materials Purchases Budget

A **direct materials purchases budget** is a detailed plan that identifies the quantity of purchases required to meet budgeted production and inventory needs and the costs associated with those purchases. A purchasing department uses this information to plan purchases of direct materials. Accountants use the same information to estimate cash payments to suppliers.

To prepare a direct materials purchases budget, managers must know what production needs will be in each accounting period in the budget; this information is provided by the production budget. They must also know the desired level of the direct materials inventory for each period and the per unit cost of direct materials. The desired level of ending direct materials inventory is usually stated as a percentage of the next period's production needs.

For example, Framecraft's desired level of ending direct materials inventory is 20 percent of the next quarter's budgeted production needs. (Its desired level of beginning direct materials inventory is 20 percent of the current quarter's budgeted production needs.)

The following three steps are involved in preparing a direct materials purchases budget:

- Step 1.** Calculate each period's total production needs in units of direct materials. Plastic is the only direct material used in Framecraft Company's picture frames; each frame requires 10 ounces. Framecraft's managers therefore calculate units of production needs in ounces; they multiply the number of frames budgeted for production in a quarter by the 10 ounces of plastic that each frame requires.

Step 2. Determine the quantity of direct materials to be purchased during each accounting period in the budget using the following formula:

$$\begin{array}{rcccl} \text{Total Units of} & & \text{Total Production} & & \text{Desired Units of} & & \text{Desired Units of} \\ \text{Direct} & = & \text{Needs in} & + & \text{Ending Direct} & - & \text{Beginning Direct} \\ \text{Materials to} & & \text{Units of Direct} & & \text{Materials} & & \text{Materials} \\ \text{Be Purchased} & & \text{Materials} & & \text{Inventory} & & \text{Inventory} \end{array}$$

Step 3. Calculate the cost of the direct materials purchases by multiplying the total number of unit purchases by the direct materials cost. Framecraft's Purchasing Department has estimated the cost of the plastic used in the picture frames at \$0.05 per ounce.

Exhibit 7-3 shows Framecraft's direct materials purchases budget for the year. Notice that each quarter's desired units of ending direct materials inventory become the next quarter's desired units of beginning direct materials inventory.

- ▶ The company's budgeted number of units for the first quarter of the following year is 150,000 ounces; its ending direct materials inventory for the fourth quarter of this year is therefore 30,000 ounces ($0.20 \times 150,000$ ounces), which is the same as the number of desired units of ending direct materials inventory for the entire year.
- ▶ Similarly, the number of desired units for the first quarter's beginning direct materials inventory—24,000 ounces—is the same as the beginning amount for the entire year.

EXHIBIT 7-3
Direct Materials Purchases Budget

Framecraft Company					
Direct Materials Purchases Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Total production units	12,000	28,000	13,000	37,500	90,500
× 10 ounces per unit	× 10	× 10	× 10	× 10	× 10
Total production needs in ounces	120,000	280,000	130,000	375,000	905,000
Plus desired ounces of ending direct materials inventory	56,000	26,000	75,000	30,000	30,000
	176,000	306,000	205,000	405,000	935,000
Less desired ounces of beginning direct materials inventory	24,000	56,000	26,000	75,000	24,000
Total ounces of direct materials to be purchased	152,000	250,000	179,000	330,000	911,000
× Cost per ounce	× \$0.05	× \$0.05	× \$0.05	× \$0.05	× \$0.05
Total cost of direct materials purchases	\$ 7,600	\$ 12,500	\$ 8,950	\$ 16,500	\$ 45,550

EXHIBIT 7-4
Direct Labor Budget

Framecraft Company Direct Labor Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Total production units	12,000	28,000	13,000	37,500	90,500
× Direct labor hours per unit	× 0.10	× 0.10	× 0.10	× 0.10	× 0.10
Total direct labor hours	1,200	2,800	1,300	3,750	9,050
× Direct labor cost per hour	× \$6	× \$6	× \$6	× \$6	× \$6
Total direct labor cost	<u>\$ 7,200</u>	<u>\$16,800</u>	<u>\$ 7,800</u>	<u>\$22,500</u>	<u>\$54,300</u>

The Direct Labor Budget

A **direct labor budget** is a detailed plan that estimates the direct labor hours needed during an accounting period and the associated costs. Production managers use estimated direct labor hours to plan how many employees will be required during the period and the hours that each will work, and accountants use estimated direct labor costs to plan for cash payments to the workers. Managers of human resources use the information in a direct labor budget in deciding whether to hire new employees or reduce the existing work force and also as a guide in training employees and preparing schedules of employee fringe benefits.

The following two steps are used to prepare a direct labor budget:

- Step 1.** Estimate the total direct labor hours by multiplying the estimated direct labor hours per unit by the anticipated units of production (see Exhibit 7-2).
- Step 2.** Calculate the total budgeted direct labor cost by multiplying the estimated total direct labor hours by the estimated direct labor cost per hour. A company's human resources department provides an estimate of the hourly labor wage.

$$\text{Total Budgeted Direct Labor Costs} = \text{Estimated Total Direct Labor Hours} \times \text{Estimated Direct Labor Cost per Hour}$$

Exhibit 7-4 shows how Framecraft Company uses these formulas to estimate the total direct labor cost. Framecraft's Production Department needs an estimated one-tenth (0.10) of a direct labor hour to complete one unit. Its Human Resources Department estimates a direct labor cost of \$6 per hour.

The Overhead Budget

An **overhead budget** is a detailed plan of anticipated manufacturing costs, other than direct materials and direct labor costs, that must be incurred to meet budgeted production needs. It has two purposes: to integrate the overhead cost budgets developed by the managers of production and production-related departments and to group information for the calculation of overhead rates for the next accounting period. The format for presenting information in an overhead budget is flexible. Grouping information by activities is useful for organizations that use activity-based costing. This approach makes it easier for accountants to determine the application rates for each cost pool.

EXHIBIT 7-5
Overhead Budget

Framecraft Company					
Overhead Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Variable overhead costs					
Factory supplies	\$ 2,160	\$ 5,040	\$ 2,340	\$ 6,750	\$ 16,290
Employee benefits	2,880	6,720	3,120	9,000	21,720
Inspection	1,080	2,520	1,170	3,375	8,145
Maintenance and repairs	1,920	4,480	2,080	6,000	14,480
Utilities	3,600	8,400	3,900	11,250	27,150
Total variable overhead costs	<u>\$11,640</u>	<u>\$27,160</u>	<u>\$12,610</u>	<u>\$36,375</u>	<u>\$ 87,785</u>
Fixed overhead costs					
Depreciation—machinery	\$ 2,810	\$ 2,810	\$ 2,810	\$ 2,810	\$ 11,240
Depreciation—building	3,225	3,225	3,225	3,225	12,900
Supervision	9,000	9,000	9,000	9,000	36,000
Maintenance and repairs	2,150	2,150	2,150	2,150	8,600
Other overhead expenses	3,175	3,175	3,175	3,175	12,700
Total fixed overhead costs	<u>\$20,360</u>	<u>\$20,360</u>	<u>\$20,360</u>	<u>\$20,360</u>	<u>\$ 81,440</u>
Total overhead costs	<u>\$32,000</u>	<u>\$47,520</u>	<u>\$32,970</u>	<u>\$56,735</u>	<u>\$169,225</u>

As Exhibit 7-5 shows, Framecraft Company prefers to group overhead information into variable and fixed costs to facilitate C-V-P analysis. The single overhead rate is the estimated total overhead costs divided by the estimated total direct labor hours.

For example, Framecraft's predetermined overhead rate is \$18.70* per direct labor hour ($\$169,225 \div 9,050$ direct labor hours), or \$1.87 per unit produced ($\18.70 per direct labor hour \times 0.10 direct labor hour per unit). The variable portion of the overhead rate is \$9.70 per direct labor hour ($\$87,785 \div 9,050$ direct labor hours), which includes factory supplies, \$1.80; employee benefits, \$2.40; inspection, \$0.90; maintenance and repairs, \$1.60; and utilities, \$3.00.

The Selling and Administrative Expense Budget

A **selling and administrative expense budget** is a detailed plan of operating expenses, other than those related to production, that are needed to support sales and overall operations during an accounting period. Accountants use this budget to estimate cash payments for products or services not used in production-related activities.

Study Note

Remember that selling and administrative expenses are period costs, not product costs.

*Rounded.

EXHIBIT 7-6
Selling and Administrative Expense
Budget

Framecraft Company					
Selling and Administrative Expense Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Variable selling and administrative expenses					
Delivery expenses	\$ 800	\$ 2,400	\$ 800	\$ 3,200	\$ 7,200
Sales commissions	1,000	3,000	1,000	4,000	9,000
Accounting	700	2,100	700	2,800	6,300
Other administrative expenses	400	1,200	400	1,600	3,600
Total variable selling and administrative expenses	<u>\$ 2,900</u>	<u>\$ 8,700</u>	<u>\$ 2,900</u>	<u>\$11,600</u>	<u>\$ 26,100</u>
Fixed selling and administrative expenses					
Sales salaries	\$ 4,500	\$ 4,500	\$ 4,500	\$ 4,500	\$ 18,000
Executive salaries	12,750	12,750	12,750	12,750	51,000
Depreciation—office equipment	925	925	925	925	3,700
Taxes and insurance	1,700	1,700	1,700	1,700	6,800
Total fixed selling and administrative expenses	<u>\$19,875</u>	<u>\$19,875</u>	<u>\$19,875</u>	<u>\$19,875</u>	<u>\$ 79,500</u>
Total selling and administrative expenses	<u>\$22,775</u>	<u>\$28,575</u>	<u>\$22,775</u>	<u>\$31,475</u>	<u>\$105,600</u>

For example, Framecraft Company's estimated variable selling and administrative expense rate is \$0.29 per unit sold, which includes delivery expenses, \$0.08; sales commissions, \$0.10; accounting, \$0.07; and other administrative expenses, \$0.04.

The Cost of Goods Manufactured Budget

A **cost of goods manufactured budget** is a detailed plan that summarizes the estimated costs of production during an accounting period. The sources of information for total manufacturing costs are the direct materials, direct labor, and overhead budgets. Most manufacturing organizations anticipate some work in process at the beginning or end of the period covered by a budget. However, Framecraft Company has a policy of no work in process on December 31 of any year. Exhibit 7-7 summarizes the company's estimated costs of production for the year. (The right-hand column of the exhibit shows the sources of key data.)

The budgeted, or standard, product unit cost for one picture frame is rounded to \$2.97 ($\$268,775 \div 90,500$ units).

EXHIBIT 7-7

Cost of Goods Manufactured Budget

Framecraft Company		Source
Cost of Goods Manufactured Budget		of Data
For the Year Ended December 31		
Direct materials used		
Direct materials inventory, beginning	\$ 1,200*	Exhibit 7-3
Purchases	<u>45,550</u>	Exhibit 7-3
Cost of direct materials available for use	\$46,750	
Less direct materials inventory, ending	<u>1,500*</u>	Exhibit 7-3
Cost of direct materials used	\$ 45,250	
Direct labor costs	54,300	Exhibit 7-4
Overhead costs	<u>169,225</u>	Exhibit 7-5
Total manufacturing costs	\$268,775	
Work in process inventory, beginning	— [†]	
Less work in process inventory, ending	<u>—[†]</u>	
Cost of goods manufactured	<u>\$268,775</u>	

*The desired direct materials inventory balance at the beginning of the year is \$1,200 (24,000 ounces × \$0.05 per ounce); at year end, it is \$1,500 (30,000 ounces × \$0.05 per ounce).

[†]It is the company's policy to have no units in process at the beginning or end of the year.

STOP & APPLY >

Sample Company is preparing a production budget for the year. The company's policy is to maintain a finished goods inventory equal to one-half of the next month's sales. Sales of 4,000 units are budgeted for April. Use the following monthly production budget for the first quarter to determine how many units should be produced in January, February, and March:

	<u>January</u>	<u>February</u>	<u>March</u>
Sales in units	3,000	2,400	6,000
Add desired units of ending finished goods inventory	<u>?</u>	<u>?</u>	<u>?</u>
Desired total units			
Less desired units of beginning finished goods inventory	<u>?</u>	<u>?</u>	<u>?</u>
Total production units	<u>?</u>	<u>?</u>	<u>?</u>

SOLUTION

	<u>January</u>	<u>February</u>	<u>March</u>
Sales in units	3,000	2,400	6,000
Add desired units of ending finished goods inventory	<u>1,200</u>	<u>3,000</u>	<u>2,000</u>
Desired total units	4,200	5,400	8,000
Less desired units of beginning finished goods inventory	<u>1,500</u>	<u>1,200</u>	<u>3,000</u>
Total production units	<u>2,700</u>	<u>4,200</u>	<u>5,000</u>

Financial Budgets

L04 Prepare a budgeted income statement, a cash budget, and a budgeted balance sheet.

With revenues and expenses itemized in the operating budgets, an organization's controller is able to prepare the financial budgets, which, as we noted earlier, are projections of financial results for the accounting period. Financial budgets include a budgeted income statement, a capital expenditures budget, a cash budget, and a budgeted balance sheet.

The Budgeted Income Statement

A **budgeted income statement** projects an organization's net income for an accounting period based on the revenues and expenses estimated for that period. Exhibit 7-8 shows Framecraft Company's budgeted income statement for the year. The company's expenses include 8 percent interest paid on a \$70,000 note payable and income taxes paid at a rate of 30 percent.

Information about projected sales and costs comes from several operating budgets, as indicated by the right-hand column of Exhibit 7-8, which identifies the sources of key data and makes it possible to trace how Framecraft Company's budgeted income statement was developed.

At this point, you can review the overall preparation of the operating budgets and the budgeted income statement by comparing the preparation flow in Figure 7-2 with the budgets in Exhibits 7-1 through 7-8. You will notice that Framecraft Company has no budget for cost of goods sold; that information is included in its budgeted income statement.

EXHIBIT 7-8
Budgeted Income Statement

Framecraft Company		
Budgeted Income Statement		
For the Year Ended December 31		Source of Data
Sales	\$450,000	Exhibit 7-1
Cost of goods sold		
Finished goods inventory, beginning	\$ 2,970	Exhibit 7-2
Cost of goods manufactured	<u>268,775</u>	Exhibit 7-7
Cost of goods available for sale	\$271,745	
Less finished goods inventory, ending	<u>4,455</u>	Exhibit 7-2
Cost of goods sold	<u>267,290</u>	
Gross margin	\$182,710	
Selling and administrative expenses	<u>105,600</u>	Exhibit 7-6
Income from operations	\$ 77,110	
Interest expense (8% × \$70,000)	<u>5,600</u>	
Income before income taxes	\$ 71,510	
Income taxes expense (30%)	<u>21,453</u>	
Net income	<u>\$ 50,057</u>	

Note: Finished goods inventory balances assume that product unit costs were the same in both years:

<u>Beginning</u>	<u>Ending</u>
1,000 units (Exhibit 7-2)	1,500 units (Exhibit 7-2)
× \$2.97*	× \$2.97*
<u>\$2,970</u>	<u>\$4,455</u>

*\$268,775 ÷ 90,500 units (Exhibits 7-7 and 7-2) = \$2.97 (Rounded)

The Capital Expenditures Budget

A **capital expenditures budget** is a detailed plan outlining the anticipated amount and timing of capital outlays for long-term assets during an accounting period. Managers rely on the information in a capital expenditures budget when making decisions about such matters as buying equipment, building a new plant, purchasing and installing a materials handling system, or acquiring another business. Framecraft Company's capital expenditures budget for the year includes \$30,000 for the purchase of a new frame-making machine. The company plans to pay \$15,000 in the first quarter of the year, when the order is placed, and \$15,000 in the second quarter of the year, when it receives the machine. This information is necessary for preparing the company's cash budget. We discuss capital expenditures in more detail in a later chapter.

The Cash Budget

A **cash budget** is a projection of the cash that an organization will receive and the cash that it will pay out during an accounting period. It summarizes the cash flow prospects of all transactions considered in the master budget. The information that the cash budget provides enables managers to plan for short-term loans when the cash balance is low and for short-term investments when the cash balance is high. Table 7-1 shows how the elements of a cash budget relate to operating, investing, and financing activities.

A cash budget excludes planned noncash transactions, such as depreciation expense, amortization expense, issuance and receipt of stock dividends, uncollectible accounts expense, and gains and losses on sales of assets. Some organizations also exclude deferred taxes and accrued interest from the cash budget.

The following formula is useful in preparing a cash budget:

$$\begin{array}{rcccl} \text{Estimated} & & \text{Total} & & \text{Total} & & \text{Estimated} \\ \text{Ending Cash} & = & \text{Estimated} & - & \text{Estimated} & + & \text{Beginning Cash} \\ \text{Balance} & & \text{Cash Receipts} & & \text{Cash Payments} & & \text{Balance} \end{array}$$

Estimates of cash receipts are based on information from several sources. Among these sources are the sales budget, the budgeted income statement, cash budgets from previous periods, cash collection records and analyses of collection trends, and records

TABLE 7-1
Elements of a Cash Budget

Activities	Cash Receipts from	Cash Payments for
Operating	Cash sales	Purchases of materials
	Cash collections on credit sales	Direct labor
	Interest income from investments	Overhead expenses
	Cash dividends from investments	Selling and administrative expenses
		Interest expense
		Income taxes
Investing	Sale of investments	Purchases of investments
	Sale of long-term assets	Purchases of long-term assets
Financing	Proceeds from loans	Loan repayments
	Proceeds from issue of stock	Cash dividends to stockholders
	Proceeds from issue of bonds	Retirement of bonds
		Purchases of treasury stock

Note: Classifications of cash receipts and cash payments correspond to those in a statement of cash flows.

pertaining to notes, stocks, and bonds. Information used in estimating cash payments comes from the operating budgets, the budgeted income statement, the capital expenditures budget, the previous year's financial statements, and loan records.

In estimating cash receipts and cash payments for the cash budget, many organizations prepare supporting schedules. For example, Framecraft Company's controller converts credit sales to cash inflows and purchases made on credit to cash outflows and then discloses those conversions on schedules that support the cash budget. The schedule in Exhibit 7-9 shows the cash that Framecraft Company expects to collect from customers during the year.

- ▶ Cash sales represent 20 percent of the company's expected sales; the other 80 percent are credit sales.
- ▶ Experience has shown that Framecraft collects payments for 60 percent of all credit sales in the quarter of sale, 30 percent in the quarter following sale, and 10 percent in the second quarter following sale.

As you can see in Exhibit 7-9, Framecraft's balance of accounts receivable was \$48,000 at the beginning of the budget year. The company expects to collect \$38,000 of that amount in the first quarter and the remaining \$10,000 in the second quarter. At the end of the budget year, the estimated ending balance of accounts receivable is \$68,000—that is, \$4,000 from the third quarter's credit sales $[(\$50,000 \times 0.80) \times 0.10]$ plus \$64,000 from the fourth quarter's sales $[(\$200,000 \times 0.80) \times 0.40]$. The expected cash collections for each quarter and for the year appear in the total cash receipts section of the cash budget.

Exhibit 7-10 shows Framecraft's schedule of expected cash payments for direct materials during the year. This information is summarized in the first line of the cash payments section of the company's cash budget. Framecraft pays 50 percent of the invoices it receives in the quarter of purchase and the other 50 percent in the following quarter.

The beginning balance of accounts payable for the first quarter is given at \$4,200. At the end of the budget year, the estimated ending balance of accounts payable is \$8,250 (50 percent of the \$16,500 of direct materials purchases in the fourth quarter).

EXHIBIT 7-9
Schedule of Expected Cash Collections
from Customers

Framecraft Company					
Schedule of Expected Cash Collections from Customers					
For the Year Ended December 31					
	Quarter				
	1	2	3	4	Year
Accounts receivable, beginning	\$38,000	\$ 10,000	\$ —	\$ —	\$ 48,000
Cash sales	10,000	30,000	10,000	40,000	90,000
Collections of credit sales					
First quarter (\$40,000)	24,000	12,000	4,000		40,000
Second quarter (\$120,000)		72,000	36,000	12,000	120,000
Third quarter (\$40,000)			24,000	12,000	36,000
Fourth quarter (\$160,000)				96,000	96,000
Total cash to be collected from customers	<u>\$72,000</u>	<u>\$124,000</u>	<u>\$74,000</u>	<u>\$160,000</u>	<u>\$430,000</u>

EXHIBIT 7-10

Schedule of Expected Cash Payments for Direct Materials

Framecraft Company					
Schedule of Expected Cash Payments for Direct Materials					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Accounts payable, beginning	\$4,200	\$ —	\$ —	\$ —	\$ 4,200
First quarter (\$7,600)	3,800	3,800			7,600
Second quarter (\$12,500)		6,250	6,250		12,500
Third quarter (\$8,950)			4,475	4,475	8,950
Fourth quarter (\$16,500)				8,250	8,250
Total cash payments for direct materials	<u>\$8,000</u>	<u>\$10,050</u>	<u>\$10,725</u>	<u>\$12,725</u>	<u>\$41,500</u>

Framecraft's cash budget for the year appears in Exhibit 7-11. It shows the estimated cash receipts and cash payments for the period, as well as the cash increase or decrease. The cash increase or decrease plus the period's beginning cash balance equals the ending cash balance anticipated for the period. As you can see in Exhibit 7-11, the beginning cash balance for the first quarter is \$20,000. This amount is also the beginning cash balance for the year.

Note that each quarter's budgeted ending cash balance becomes the next quarter's beginning cash balance. Also note that equal income tax payments are made quarterly. You can trace the development of this budget by referring to the data sources listed in the exhibit.

Many organizations maintain a minimum cash balance to provide a margin of safety against uncertainty. If the ending cash balance on the cash budget falls below the minimum level required, short-term borrowing may be necessary to cover planned cash payments during the year. If the ending cash balance is significantly larger than the organization needs, it may invest the excess cash in short-term securities to generate additional income.

For example, if Framecraft Company wants a minimum of \$10,000 cash available at the end of each quarter, its balance of \$7,222 at the end of the first quarter indicates that there is a problem. Framecraft's management has several options for handling this problem. It can borrow cash to cover the first quarter's cash needs, delay purchasing the new extrusion machine until the second quarter, or reduce some of the operating expenses. On the other hand, the balance at the end of the fourth quarter may be higher than the company wants, in which case management might invest a portion of the idle cash in short-term securities.

**FOCUS ON BUSINESS PRACTICE****Can Budgeting Lead to a Breakdown in Corporate Ethics?**

When budgets are used to force performance results, as they were at **WorldCom**, breaches in corporate ethics can occur. One former WorldCom employee described the situation at that company as follows: "You would have a budget, and he [WorldCom CEO Bernard Ebbers] would

mandate that you had to be 2% under budget. Nothing else was acceptable."² This type of restrictive budget policy appears to have been a factor in many of the corporate scandals that occurred in the last decade.

EXHIBIT 7-11 Cash Budget

Framecraft Company Cash Budget For the Year Ended December 31						Source of Data	
Quarter					Year		
1	2	3	4				
Cash receipts							
Cash collections from customers	\$ 72,000	\$ 124,000	\$ 74,000	\$ 160,000	\$ 430,000	Exhibit 7-9	
Total cash receipts	<u>\$ 72,000</u>	<u>\$ 124,000</u>	<u>\$ 74,000</u>	<u>\$ 160,000</u>	<u>\$ 430,000</u>		
Cash payments							
Direct materials	\$ 8,000	\$ 10,050	\$ 10,725	\$ 12,725	\$ 41,500	Exhibit 7-10	
Direct labor	7,200	16,800	7,800	22,500	54,300	Exhibit 7-4	
Factory supplies	2,160	5,040	2,340	6,750	16,290	Exhibit 7-5	
Employee benefits	2,880	6,720	3,120	9,000	21,720		
Inspection	1,080	2,520	1,170	3,375	8,145		
Variable maintenance and repairs	1,920	4,480	2,080	6,000	14,480		
Utilities	3,600	8,400	3,900	11,250	27,150		
Supervision	9,000	9,000	9,000	9,000	36,000		
Fixed maintenance and repairs	2,150	2,150	2,150	2,150	8,600		
Other overhead expenses	3,175	3,175	3,175	3,175	12,700		
Delivery expenses	800	2,400	800	3,200	7,200		
Sales commissions	1,000	3,000	1,000	4,000	9,000		Exhibit 7-6
Accounting	700	2,100	700	2,800	6,300		
Other administrative expenses	400	1,200	400	1,600	3,600		
Sales salaries	4,500	4,500	4,500	4,500	18,000		
Executive salaries	12,750	12,750	12,750	12,750	51,000		
Taxes and insurance	1,700	1,700	1,700	1,700	6,800		
Capital expenditures*	15,000	15,000			30,000		
Interest expense	1,400	1,400	1,400	1,400	5,600		
Income taxes	5,363	5,363	5,363	5,364	21,453		
Total cash payments	<u>\$ 84,778</u>	<u>\$ 117,748</u>	<u>\$ 74,073</u>	<u>\$ 123,239</u>	<u>\$ 399,838</u>	Exhibit 7-8	
Cash increase (decrease)	\$(12,778)	\$ 6,252	\$ (73)	\$ 36,761	\$ 30,162		
Beginning cash balance	<u>20,000</u>	7,222	13,474	13,401	<u>20,000</u>		
Ending cash balance	<u>\$ 7,222</u>	<u>\$ 13,474</u>	<u>\$ 13,401</u>	<u>\$ 50,162</u>	<u>\$ 50,162</u>		

*The company plans to purchase an extrusion machine costing \$30,000 and to pay for it in two installments of \$15,000 each in the first and second quarters of the year.

The Budgeted Balance Sheet

A **budgeted balance sheet** projects an organization's financial position at the end of an accounting period. It uses all estimated data compiled in the course of preparing a master budget and is the final step in that process. Exhibit 7-12 presents Framecraft Company's budgeted balance sheet at the end of the budget year. Again, the data sources are listed in the exhibit. The beginning balances for Land, Notes Payable, Common Stock, and Retained Earnings were \$50,000, \$70,000, \$150,000, and \$50,810, respectively.

EXHIBIT 7-12
Budgeted Balance Sheet

Framecraft Company		Source
Budgeted Balance Sheet		of Data
December 31		
Assets		
Current assets		
Cash	\$ 50,162	Exhibit 7-11
Accounts receivable	68,000 ^a	Exhibit 7-9
Direct materials inventory	1,500	Exhibit 7-7
Work in process inventory	—	Exhibit 7-7, Note
Finished goods inventory	4,455	Exhibit 7-8, Note
Total current assets	<u>\$124,117</u>	
Property, plant, and equipment		
Land	\$ 50,000	
Plant and equipment ^b	\$200,000	
Less accumulated depreciation ^c	<u>45,000</u> <u>155,000</u>	
Total property, plant, and equipment	<u>205,000</u>	
Total assets	<u><u>\$329,117</u></u>	
Liabilities		
Current liabilities		
Accounts payable	<u>\$ 8,250^d</u>	Exhibit 7-10, Note
Total current liabilities	\$ 8,250	
Long-term liabilities		
Notes payable	<u>70,000</u>	
Total liabilities	\$ 78,250	
Stockholders' Equity		
Common stock	\$150,000	
Retained earnings ^e	<u>100,867</u>	
Total stockholders' equity	<u>250,867</u>	
Total liabilities and stockholders' equity	<u><u>\$329,117</u></u>	
^a The accounts receivable balance at year end is \$68,000: \$4,000 from the third quarter's sales $[(\$50,000 \times 0.80) \times 0.10]$ plus \$64,000 from the fourth quarter's sales $[(\$200,000 \times 0.80) \times 0.40]$.		
^b The plant and equipment balance includes the \$30,000 purchase of an extrusion machine.		
^c The accumulated depreciation balance includes depreciation expense of \$27,840 for machinery, building, and office equipment (\$11,240, \$12,900, and \$3,700, respectively).		
^d At year end, the estimated ending balance of accounts payable is \$8,250 (50 percent of the \$16,500 of direct materials purchases in the fourth quarter).		
^e The retained earnings balance at December 31 equals the beginning retained earnings balance plus the net income projected for the year (\$50,810 and \$50,057, respectively).		

STOP & APPLY >

Sample Corporation's budgeted balance sheet for the beginning of the coming year shows total assets of \$5,000,000 and total liabilities of \$2,000,000. Common stock and retained earnings make up the entire stockholders' equity section of the balance sheet. Common stock remains at its beginning balance of \$1,500,000. The projected net income for the year is \$350,000. The company plans to pay no cash dividends. What is the balance of retained earnings at the beginning and end of the year?

SOLUTION

Using the accounting equation $A = L + SE$ (knowing that common stock + retained earnings makes up the entire SE) and the information given:

Beginning retained earnings:

$$\$5,000,000 = \$2,000,000 + \$1,500,000 + \text{Beginning Retained Earnings}$$

Thus, the beginning balance of retained earnings is \$1,500,000.

Ending retained earnings:

Beginning retained earnings	\$1,500,000
+ Net income	350,000
– Dividends	<u>0</u>
Ending retained earnings	<u><u>\$1,850,000</u></u>

A LOOK BACK AT ► FRAMERICA CORPORATION

In this chapter's Decision Point, we noted that one of **Framera Corporation's** priorities is to help employees attain their personal goals. We also noted that a participatory budgeting process is a highly effective way of achieving congruence between a company's goals and objectives and employees' personal aspirations. We asked these questions:

- How does Framera Corporation translate long-term goals into operating objectives?
- What is the effect of Framera's budgeting process?

As you know after reading this chapter, budgets translate a company's long-term goals into annual operating objectives. Because the budgets express these goals and objectives in concrete terms, managers and employees are able to act in ways that will achieve them. Budgets also give managers and employees a means of monitoring the results of their actions. At companies like Framera, the ongoing dialogue about strategy that is part of the participative budgeting process fosters rapid improvements in productivity and customer service, as well as innovation in product and market development.

Review Problem

Preparing a Cash
Budget
LO4

Suppose a company like **Framera Corporation** has an Info Processing Division that provides database management services for the professional photographers who buy its frames. The division uses state-of-the-art equipment and employs five information specialists. Each specialist works an average of 160 hours a month. The division's controller has compiled the following information:



	Actual Data for Year		Forecasted Data for Year		
	November	December	January	February	March
Client billings (sales)	\$25,000	\$35,000	\$25,000	\$20,000	\$40,000
Selling and administrative expenses	12,000	13,000	12,000	11,000	12,500
Operating supplies	2,500	3,500	2,500	2,500	4,000
Processing overhead	3,200	3,500	3,000	2,500	3,500

Of the client billings, 60 percent are collected during the month of sale, 30 percent are collected in the first month following the sale, and 10 percent are collected in the second month following the sale. Operating supplies are paid for in the month of purchase. Selling and administrative expenses and processing overhead are paid in the month following the cost's incurrence.

The division has a bank loan of \$12,000 at a 12 percent annual interest rate. Interest is paid monthly, and \$2,000 of the loan principal is due on February 28 of next year. Income taxes of \$4,550 for this calendar year are due and payable on March 15 of next year. The information specialists earn \$8.50 an hour, and all payroll-related employee benefit costs are included in processing overhead. The division anticipates no capital expenditures for the first quarter of the coming year. It expects its cash balance on December 31 of this year to be \$13,840.

Required

Prepare a monthly cash budget for the Info Processing Division for the three-month period ending March 31 of next year. Comment on whether the ending cash balances are adequate for the division's cash needs.

Answers to Review Problem

Info Processing Division Monthly Cash Budgets For the Quarter Ended March 31				
	January	February	March	Quarter
Total cash receipts	\$28,000	\$23,000	\$32,500	\$83,500
Cash payments				
Operating supplies	\$ 2,500	\$ 2,500	\$ 4,000	\$ 9,000
Direct labor	6,800	6,800	6,800	20,400
Selling & admin. expenses	13,000	12,000	11,000	36,000
Processing overhead	3,500	3,000	2,500	9,000
Interest expense	120	120	100	340
Loan payment	—	2,000	—	2,000
Income tax payment	—	—	4,550	4,550
Total cash payments	\$25,920	\$26,420	\$28,950	\$81,290
Cash increase (decrease)	\$ 2,080	(\$ 3,420)	\$ 3,550	\$ 2,210
Beginning cash balance	13,840	15,920	12,500	13,840
Ending cash balance	\$15,920	\$12,500	\$16,050	\$16,050

The details supporting the individual computations in this cash budget are as follows:

	January	February	March
Client billings			
November	\$ 2,500	—	—
December	10,500	\$ 3,500	—
January	15,000	7,500	\$ 2,500
February	—	12,000	6,000
March	—	—	24,000
	<u>\$28,000</u>	<u>\$23,000</u>	<u>\$32,500</u>
Operating supplies			
Paid for in the month purchased	\$ 2,500	\$ 2,500	\$ 4,000
Direct labor			
5 employees × 160 hours a month × \$8.50 an hour	6,800	6,800	6,800
Selling and administrative expenses			
Paid in the month following incurrence	13,000	12,000	11,000
Processing overhead			
Paid in the month following incurrence	3,500	3,000	2,500
Interest expense			
January and February = 1% of \$12,000	120	120	—
March = 1% of \$10,000	—	—	100
Loan payment	—	2,000	—
Income tax payment	—	—	4,550

The ending cash balances of \$15,920, \$12,500, and \$16,050 for January, February, and March, respectively, appear to be comfortable but not too large for the Info Processing Division.

STOP & REVIEW >

LO1 Define *budgeting*, and explain budget basics.

Budgeting is the process of identifying, gathering, summarizing, and communicating financial and nonfinancial information about an organization's future activities. Budgeting is not only an essential part of planning; it also helps managers control, evaluate, and report on operations. When managers develop budgets, they match their organizational goals with the resources necessary to accomplish those goals. During the budgeting process, they evaluate operational, tactical, value chain, and capacity issues; assess how resources can be efficiently used; and develop contingency budgets as business conditions change. During the budget period, budgets authorize managers to use resources and provide guidelines to control costs. When managers assess performance, they can compare actual operating results to budget plans and evaluate the variances. Participative budgeting, a process in which personnel at all levels actively engage in making decisions about the budget, is key to a successful budget.

Budgets can be static, meaning they do not change during the annual budget period, or continuous, meaning they are a forward-moving budget for the next 12 months. Traditional budgeting approaches require managers to justify only budget changes over the past year. An alternative to traditional budgeting is a zero-based budgeting approach, which requires every budget item to be justified, not just the changes.

A budget committee made up of top management has overall responsibility for budget implementation. The company's controller and the budget committee oversee each stage in the preparation of the master budget, mediate any departmental disputes that may arise during the process, and give final approval to the budget. After the master budget is approved, periodic reports from department managers enable the committee to monitor the progress the company is making in attaining budget targets.

LO2 Identify the elements of a master budget in different types of organizations and the guidelines for preparing budgets.

A master budget consists of a set of operating budgets and a set of financial budgets that detail an organization's financial plans for a specific accounting period. The operating budgets serve as the basis for preparing the financial budgets, which include a budgeted income statement, a capital expenditures budget, a cash budget, and a budgeted balance sheet.

The operating budgets of a manufacturing organization include budgets for sales, production, direct materials purchases, direct labor, overhead, selling and administrative expenses, and cost of goods manufactured. The operating budgets of a retail organization include budgets for sales, purchases, selling and administrative expenses, and cost of goods sold. The operating budgets of a service organization include budgets for service revenue, labor, services overhead, and selling and administrative expenses.

The guidelines for preparing budgets include identifying the purpose of the budget, the user group and its information needs, and the sources of budget information; establishing a clear format for the budget; and using appropriate formulas and calculations to derive the quantitative information.

LO3 Prepare the operating budgets that support the financial budgets.

The initial step in preparing a master budget in any type of organization is to prepare a sales budget. Once sales have been estimated, the manager of a manufacturing organization's production department is able to prepare a budget that shows how many units of products must be manufactured to meet the projected sales volume. With that information in hand, other managers are able to prepare budgets for direct materials purchases, direct labor, overhead, selling and administrative expenses, and

cost of goods manufactured. A cost of goods sold budget may be prepared separately, or it may be included in the cost of goods manufactured budget for a manufacturing organization. The operating budgets supply the information needed to prepare the financial budgets.

LO4 Prepare a budgeted income statement, a cash budget, and a budgeted balance sheet.

With estimated revenues and expenses itemized in the operating budgets, a controller is able to prepare the financial budgets. A budgeted income statement projects an organization's net income for a specific accounting period. A capital expenditures budget estimates the amount and timing of the organization's capital outlays during the period. A cash budget projects its cash receipts and cash payments for the period. Estimates of cash receipts and payments are needed to prepare a cash budget. Information about cash receipts comes from several sources, including the sales budget, the budgeted income statement, and various financial records. Sources of information about cash payments include the operating budgets, the budgeted income statement, and the capital expenditures budget. The difference between the total estimated cash receipts and total estimated cash payments is the cash increase or decrease anticipated for the period. That total plus the period's beginning cash balance equals the ending cash balance. The final step in developing a master budget is to prepare a budgeted balance sheet, which projects the organization's financial position at the end of the accounting period. All budgeted data are used in preparing this statement.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Budget committee 251 (LO1)	Cost of goods manufactured budget 263 (LO3)	Pro forma financial statements 253 (LO2)
Budgeted balance sheet 269 (LO4)	Direct labor budget 261 (LO3)	Sales budget 257 (LO3)
Budgeted income statement 265 (LO4)	Direct materials purchases budget 259 (LO3)	Sales forecast 257 (LO3)
Budgeting 250 (LO1)	Financial budgets 253 (LO2)	Selling and administrative expense budget 262 (LO3)
Budgets 250 (LO1)	Master budget 253 (LO2)	Static budgets 252 (LO1)
Capital expenditures budget 266 (LO4)	Operating budgets 253 (LO2)	Strategic planning 251 (LO1)
Cash budget 266 (LO4)	Overhead budget 261 (LO3)	Zero-based budgeting 252 (LO1)
Continuous budget 252 (LO1)	Participative budgeting 252 (LO1)	
	Production budget 258 (LO3)	

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Budgeting in a Retail Organization

SE 1. Sam Zubac is the manager of the shoe department in a discount department store. During a recent meeting, Zubac and his supervisor agreed that Zubac's goal for the next year would be to increase the number of pairs of shoes sold by 20 percent. The department sold 8,000 pairs of shoes last year. Two sales people currently work for Zubac. What types of budgets should Zubac use to help him achieve his sales goal? What kinds of information should those budgets provide?

L01 Budgetary Control

SE 2. Andi Kures owns a tree nursery. She analyzes her business's results by comparing actual operating results with figures budgeted at the beginning of the year. When the business generates large profits, she often overlooks the differences between actual and budgeted data. But when profits are low, she spends many hours analyzing the differences. If you owned Kures's business, would you use her approach to budgetary control? If not, what changes would you make?

L02 L03 Components of a Master Budget

SE 3. A master budget is a compilation of forecasts for the coming year or operating cycle made by various departments or functions within an organization. What is the most important forecast made in a master budget? List the reasons for your answer. Which budgets must managers prepare before they can prepare a direct materials purchases budget?

L03 Production Budget

SE 4. Isobel Law, the controller for Aberdeen Lock Company, is preparing a production budget for the year. The company's policy is to maintain a finished goods inventory equal to one-half of the following month's sales. Sales of 7,000 locks are budgeted for April. Complete the monthly production budget for the first quarter:

	January	February	March
Sales in units	5,000	4,000	6,000
Add desired units of ending finished goods inventory	<u>2,000</u>	<u>?</u>	<u>?</u>
Desired total units	7,000		
Less desired units of beginning finished goods inventory	<u>?</u>	<u>?</u>	<u>?</u>
Total production units	<u><u>4,500</u></u>	<u><u>?</u></u>	<u><u>?</u></u>

L03 Preparing an Operating Budget

SE 5. Ulster Company expects to sell 50,000 units of its product in the coming year. Each unit sells for \$45. Sales brochures and supplies for the year are expected to cost \$9,000. Two sales representatives cover the southeast region. Each representative's base salary is \$20,000, and each earns a sales commission of 5 percent of the selling price of the units he or she sells. The sales representatives supply their own transportation; they are reimbursed for travel at a rate of

\$0.60 per mile. The company estimates that the sales representatives will drive a total of 75,000 miles next year. From the information provided, calculate Ulster Company's budgeted selling expenses for the coming year.

L03 L04 Budgeted Gross Margin

SE 6. Operating budgets for the Paolo Company reveal the following information: net sales, \$450,000; beginning materials inventory, \$23,000; materials purchased, \$185,000; beginning work in process inventory, \$64,700; beginning finished goods inventory, \$21,600; direct labor costs, \$34,000; overhead applied, \$67,000; ending work in process inventory, \$61,200; ending materials inventory, \$18,700; and ending finished goods inventory, \$16,300. Compute Paolo Company's budgeted gross margin.

L04 Estimating Cash Collections

SE 7. KDP Insurance Company specializes in term life insurance contracts. Cash collection experience shows that 30 percent of billed premiums are collected in the month before they are due, 60 percent are paid in the month in which they are due, and 6 percent are paid in the month following their due date. Four percent of the billed premiums are paid late (in the second month following their due date) and include a 10 percent penalty payment. Total billing notices in January were \$58,000; in February, \$62,000; in March, \$66,000; in April, \$65,000; in May, \$60,000; and in June, \$62,000. How much cash does the company expect to collect in May?

L04 Cash Budget

SE 8. The projections of direct materials purchases that follow are for the Stromboli Corporation.

	Purchases on Account	Cash Purchases
December, 2010	\$40,000	\$20,000
January, 2011	60,000	30,000
February, 2011	50,000	25,000
March, 2011	70,000	35,000

The company pays for 60 percent of purchases on account in the month of purchase and 40 percent in the month following the purchase. Prepare a monthly schedule of expected cash payments for direct materials for the first quarter of 2011.

L04 Cash Budget

SE 9. Alberta Limited needs a cash budget for the month of November. The following information is available:

- The cash balance on November 1 is \$6,000.
- Sales for October and November are \$80,000 and \$60,000, respectively. Cash collections on sales are 30 percent in the month of sale and 65 percent in the month after the sale; 5 percent of sales are uncollectible.
- General expenses budgeted for November are \$25,000 (depreciation represents \$2,000 of this amount).
- Inventory purchases will total \$30,000 in October and \$40,000 in November. The company pays for half of its inventory purchases in the month of purchase and for the other half the month after purchase.
- The company will pay \$4,000 in cash for office furniture in November. Sales commissions for November are budgeted at \$12,000.
- The company maintains a minimum ending cash balance of \$4,000 and can borrow from the bank in multiples of \$100. All loans are repaid after 60 days.

Prepare a cash budget for Alberta Limited for the month of November.

LO4 Budgeted Balance Sheet

SE 10. Wellman Corporation's budgeted balance sheet for the coming year shows total assets of \$4,650,000 and total liabilities of \$1,900,000. Common stock and retained earnings make up the entire stockholders' equity section of the balance sheet. Common stock remains at its beginning balance of \$1,500,000. The projected net income for the year is \$349,600. The company pays no cash dividends. What is the balance of retained earnings at the beginning of the budget period?

Exercises**LO1 Characteristics of Budgets**

E 1. You recently attended a workshop on budgeting and overheard the following comments as you walked to the refreshment table:

1. "Budgets are the same regardless of the size of an organization or management's role in the budgeting process."
2. "Budgets can include financial or nonfinancial data. In our organization, we plan the number of hours to be worked and the number of customer contacts we want our sales people to make."
3. "All budgets are complicated. You have to be an expert to prepare one."
4. "Budgets don't need to be highly accurate. No one in our company stays within a budget anyway."

Do you agree or disagree with each comment? Explain your answers.

LO1 Budgeting and Goals

E 2. Effective planning of long- and short-term goals has contributed to the success of Multitasker Calendars, Inc. Described below are the actions that the company's management team took during a recent planning meeting. Indicate whether the goals related to those actions are short-term or long-term.

1. In forecasting the next 10-year period, the management team considered economic and industry forecasts, employee-management relationships, and the structure and role of management.
2. Based on the 10-year forecast, the team made decisions about next year's sales and profit targets.

LO1 Budgeting and Goals

E 3. Assume that you work in the accounting department of a small wholesale warehousing company. Inspired by a recent seminar on budgeting, the company's president wants to develop a budgeting system and has asked you to direct it. Identify the points concerning the initial steps in the budgeting process that you should communicate to the president. Concentrate on principles related to long-term goals and short-term goals.

LO2 LO3 Components of a Master Budget

LO4 E 4. Identify the order in which the following budgets are prepared. Use the letter *a* to indicate the first budget to be prepared, *b* for the second, and so on.

1. Production budget
2. Direct labor budget
3. Direct materials purchases budget
4. Sales budget
5. Budgeted balance sheet
6. Cash budget
7. Budgeted income statement

L03 Sales Budget

E 5. Quarterly and annual sales for this year for Steen Manufacturing Company follow. Prepare a sales budget for next year for the company based on the estimated percentage increases shown by product class. Show both quarterly and annual totals for each product class.

Steen Manufacturing Company Actual Sales Revenue For the Year Ended December 31						
Product Class	January– March	April– June	July– September	October– December	Annual Totals	Estimated Percent Increases by Product Class
Marine products	\$ 44,500	\$ 45,500	\$ 48,200	\$ 47,900	\$ 186,100	10%
Mountain products	36,900	32,600	34,100	37,200	140,800	5%
River products	29,800	29,700	29,100	27,500	116,100	30%
Hiking products	38,800	37,600	36,900	39,700	153,000	15%
Running products	47,700	48,200	49,400	49,900	195,200	25%
Biking products	<u>65,400</u>	<u>65,900</u>	<u>66,600</u>	<u>67,300</u>	<u>265,200</u>	20%
Totals	<u>\$263,100</u>	<u>\$259,500</u>	<u>\$264,300</u>	<u>\$269,500</u>	<u>\$1,056,400</u>	

L03 Production Budget

E 6. Santa Fe Corporation produces and sells a single product. Expected sales for September are 12,000 units; for October, 15,000 units; for November, 9,000 units; for December, 10,000 units; and for January, 14,000 units. The company's desired level of ending finished goods inventory at the end of a month is 10 percent of the following month's sales in units. At the end of August, 1,200 units were on hand. How many units need to be produced in the fourth quarter?

L03 Direct Materials Purchases Budget

E 7. The U-Z Door Company manufactures garage door units. The units include hinges, door panels, and other hardware. Prepare a direct materials purchases budget for the first quarter of the year based on budgeted production of 16,000 garage door units. Sandee Morton, the controller, has provided the information that follows.

Hinges	4 sets per door	\$11.00 per set
Door panels	4 panels per door	\$27.00 per panel
Other hardware	1 lock per door	\$31.00 per lock
	1 handle per door	\$22.50 per handle
	2 roller tracks per door	\$16.00 per set of 2 roller tracks
	8 rollers per door	\$ 4.00 per roller

Assume no beginning or ending quantities of direct materials inventory.

L03 Direct Materials Purchases Budget

E 8. Hard Corporation projects sales of \$230,000 in May, \$250,000 in June, \$260,000 in July, and \$240,000 in August. Since the dollar value of the company's cost of goods sold is generally 65 percent of total sales, cost of goods sold is \$149,500 in May, \$162,500 in June, \$169,000 in July, and \$156,000 in August. The dollar value of its desired ending inventory is 25 percent of the following month's cost of goods sold.

Compute the total purchases in dollars budgeted for June and the total purchases in dollars budgeted for July.

L03 Direct Labor Budget

E 9. Paige Metals Company has two departments—Cutting and Grinding—and manufactures three products. Budgeted unit production for the coming year is 21,000 of Product T, 36,000 of Product M, and 30,000 of Product B. The company is currently analyzing direct labor hour requirements for the coming year. Data for each department are as follows:

	Cutting	Grinding
Estimated hours per unit		
Product T	1.1	0.5
Product M	0.6	2.9
Product B	3.2	1.0
Hourly labor rate	\$9	\$7

Prepare a direct labor budget for the coming year that shows the budgeted direct labor costs for each department and for the company as a whole.

L03 Overhead Budget

E 10. Carole Dahl is chief financial officer of the Phoenix Division of Dahl Corporation, a multinational company with three operating divisions. As part of the budgeting process, Dahl's staff is developing the overhead budget for next year. The division estimates that it will manufacture 50,000 units during the year. The budgeted cost information is as follows:

	Variable Rate per Unit	Total Fixed Costs
Indirect materials	\$1.00	
Indirect labor	4.00	
Supplies	0.40	
Repairs and maintenance	3.00	\$ 40,000
Electricity	0.10	20,000
Factory supervision		180,000
Insurance		25,000
Property taxes		35,000
Depreciation—machinery		82,000
Depreciation—building		72,000

Using these data, prepare the division's overhead budget for next year.

L04 Cash Collections

E 11. Dacahr Bros., Inc., is an automobile maintenance and repair company with outlets throughout the western United States. Henley Turlington, the company controller, is starting to assemble the cash budget for the fourth quarter. Projected sales for the quarter are as follows:

	On Account	Cash
October	\$452,000	\$196,800
November	590,000	214,000
December	720,500	218,400

Cash collection records pertaining to sales on account indicate the following collection pattern:

Month of sale	40%
First month following sale	30
Second month following sale	28
Uncollectible	2

Sales on account during August were \$346,000. During September, sales on account were \$395,000.

Compute the amount of cash to be collected from customers during each month of the fourth quarter.

LO4 Cash Collections

E 12. XYZ Company collects payment on 50 percent of credit sales in the month of sale, 40 percent in the month following sale, and 5 percent in the second month following the sale. Its sales budget is as follows:

Month	Cash Sales	Credit Sales
May	\$20,000	\$ 40,000
June	40,000	60,000
July	60,000	80,000
August	80,000	100,000

Compute XYZ Company's total cash collections in July and its total cash collections in August.

LO4 Cash Budget

E 13. SABA Enterprises needs a cash budget for the month of June. The following information is available:

- The cash balance on June 1 is \$4,000.
- Sales for May and June are \$50,000 and \$40,000, respectively. Cash collections on sales are 40 percent in the month of sale and 50 percent in the month after the sale; 10 percent of sales are uncollectible.
- General expenses budgeted for June are \$20,000 (depreciation represents \$1,000 of this amount).
- Inventory purchases will total \$40,000 in May and \$30,000 in June. The company pays for half of its inventory purchases in the month of purchase and for the other half the month after purchase.
- The company will pay \$5,000 in cash for office furniture in June. Sales commissions for June are budgeted at \$6,000.
- The company maintains a minimum ending cash balance of \$4,000 and can borrow from the bank in multiples of \$100. All loans are repaid after 60 days.

Prepare a cash budget for SABA Enterprises for the month of June.

LO4 Cash Budget

E 14. Tex Kinkaid's dream was to develop the biggest produce operation with the widest selection of fresh fruits and vegetables in northern Texas. Within three years of opening Minigarden Produce, Inc., Kincaid accomplished his objective. Kinkaid has asked you to prepare monthly cash budgets for Minigarden Produce for the quarter ended September 30.

Credit sales to retailers in the area constitute 80 percent of Minigarden Produce's business; cash sales to customers at the company's retail outlet make up the other 20 percent. Collection records indicate that Minigarden Produce collects payment on 50 percent of all credit sales during the month of sale, 30 percent in the month after the sale, and 20 percent in the second month after the sale.

The company's total sales in May were \$66,000; in June, they were \$67,500. Anticipated sales in July are \$69,500; in August, \$76,250; and in September, \$84,250. The company's purchases are expected to total \$43,700 in July, \$48,925 in August, and \$55,725 in September. The company pays for all purchases in cash.

Projected monthly costs for the quarter include \$1,040 for heat, light, and power; \$375 for bank fees; \$1,925 for rent; \$1,120 for supplies; \$1,705 for depreciation of equipment; \$1,285 for equipment repairs; and \$475 for miscellaneous expenses. Other projected costs for the quarter are salaries and wages of \$18,370 in July, \$19,200 in August, and \$20,300 in September.

The company's cash balance at June 30 was \$2,745. It has a policy of maintaining a minimum monthly cash balance of \$1,500.

1. Prepare a monthly cash budget for Minigarden Produce, Inc., for the quarter ended September 30.
2. Should Minigarden Produce anticipate taking out a loan during the quarter? If so, how much should it borrow, and when?

LO4 Budgeted Income Statement

E 15. Delft House, Inc., a multinational company based in Amsterdam, organizes and coordinates art shows and auctions throughout the world. Its budgeted and actual costs for last year are as follows:

	Budgeted Cost	Actual Cost
Salaries expense, staging	€ 480,000	€ 512,800
Salaries expense, executive	380,000	447,200
Travel costs	640,000	652,020
Auctioneer services	540,000	449,820
Space rental costs	251,000	246,580
Printing costs	192,000	182,500
Advertising expense	169,000	183,280
Insurance, merchandise	84,800	77,300
Insurance, liability	64,000	67,100
Home office costs	209,200	219,880
Shipping costs	105,000	112,560
Miscellaneous	25,000	25,828
Total operating expenses	<u>€3,140,000</u>	<u>€3,176,868</u>
Net receipts	<u>€6,200,000</u>	<u>€6,369,200</u>

Delft House, Inc., has budgeted the following fixed costs for the coming year: executive salaries, €440,000; advertising expense, €190,000; merchandise insurance, €80,000; and liability insurance, €68,000. Additional information pertaining to the operations of Delft House, Inc., in the coming years is as follows:

- a. Net receipts are estimated at €6,400,000.
- b. Salaries expense for staging will increase 20 percent over the actual figures for the last year.

- c. Travel costs are expected to be 11 percent of net receipts.
- d. Auctioneer services will be billed at 9.5 percent of net receipts.
- e. Space rental costs will be 20 percent higher than the amount budgeted in the last year.
- f. Printing costs are expected to be €190,000.
- g. Home office costs are budgeted for €230,000.
- h. Shipping costs are expected to be 20 percent higher than the amount budgeted in the last year.
- i. Miscellaneous expenses for the coming year will be budgeted at €28,000.

Because the company sells only services, it has expenses only and no cost of sales. (Net receipts equal gross margin.)

1. Using a 40 percent income tax rate, prepare the company's budgeted income statement for the coming year.
2. Should the budget committee be worried about the trend in the company's operations? Explain your answer.

Problems

L03 Preparing Operating Budgets

P 1. The principal product of Yangsoo Enterprises, Inc., is a multipurpose hammer that carries a lifetime guarantee. Listed next are cost and production data for the Yangsoo hammer.

Direct materials

Anodized steel: 2 kilograms per hammer at \$1.60 per kilogram

Leather strapping for the handle: 0.5 square meter per hammer at \$4.40 per square meter

Direct labor

Forging operation: \$12.50 per labor hour; 6 minutes per hammer

Leather-wrapping operation: \$12.00 per direct labor hour; 12 minutes per hammer

Overhead

Forging operation: rate equals 70 percent of department's direct labor dollars

Leather-wrapping operation: rate equals 50 percent of department's direct labor dollars

In October, November, and December, Yangsoo Enterprises expects to produce 108,000, 104,000, and 100,000 hammers, respectively. The company has no beginning or ending balances of direct materials inventory or work in process inventory for the year.

Required

1. For the three-month period ending December 31, prepare monthly production cost information for the Yangsoo hammer. Classify the costs as direct materials, direct labor, or overhead, and show your computations.
2. Prepare a cost of goods manufactured budget for the hammer. Show monthly cost data and combined totals for the quarter for each cost category.

LO3 LO4 Preparing a Comprehensive Budget

P 2. Bertha's Bathworks produces hair and bath products. Its biggest customer is a national retail chain that specializes in such products. Bertha Jackson, the owner of Bertha's Bathworks, would like to have an estimate of the company's net income in the coming year.

Required

Project Bertha's Bathworks' net income next year by completing the operating budgets and budgeted income statement that follow.

1. Sales Budget:

Bertha's Bathworks Sales Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Sales in units	4,000	3,000	5,000	5,000	17,000
× Selling price per unit	× \$5	× ?	× ?	× ?	× ?
Total sales	<u>\$20,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

2. Production Budget:

Bertha's Bathworks Production Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Sales in units	4,000	?	?	?	?
Plus desired units of ending finished goods inventory*	<u>300</u>	<u>?</u>	<u>?</u>	<u>600</u>	<u>600</u>
Desired total units	4,300				
Less desired units of beginning finished goods inventory†	<u>400</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>400</u>
Total production units	<u>3,900</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

*Desired units of ending finished goods inventory = 10% of next quarter's budgeted sales.

†Desired units of beginning finished goods inventory = 10% of current quarter's budgeted sales.

3. Direct Materials Purchases Budget:

Bertha's Bathworks					
Direct Materials Purchases Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Total production units	3,900	3,200	5,000	5,100	17,200
× 3 ounces per unit	× 3	× ?	× ?	× ?	× ?
Total production needs in ounces	11,700	?	?	?	?
Plus desired ounces of ending direct materials inventory*	<u>1,920</u>	<u>?</u>	<u>?</u>	<u>3,600</u>	<u>3,600</u>
	13,620	?	?	?	?
Less desired ounces of beginning direct materials inventory†	<u>2,340</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>2,340</u>
Total ounces of direct materials to be purchased	11,280	?	?	?	?
× Cost per ounce	× \$0.10	× ?	× ?	× ?	× ?
Total cost of direct materials purchases	<u>\$ 1,128</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

*Desired ounces of ending direct materials inventory = 20% of next quarter's budgeted production needs in ounces.

†Desired ounces of beginning direct materials inventory = 20% of current quarter's budgeted production needs in ounces.

4. Direct Labor Budget:

Bertha's Bathworks					
Direct Labor Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Total production units	3,900	?	?	?	?
× Direct labor hours per unit	× 0.10	× ?	× ?	× ?	× ?
Total direct labor hours	390	?	?	?	?
× Direct labor cost per hour	× \$7	× ?	× ?	× ?	× ?
Total direct labor cost	<u>\$2,730</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

5. Overhead Budget:

Bertha's Bathworks Overhead Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Variable overhead costs					
Factory supplies (\$0.05)	\$ 195	?	?	?	?
Employee benefits (\$0.25)	975	?	?	?	?
Inspection (\$0.10)	390	?	?	?	?
Maintenance and repairs (\$0.15)	585	?	?	?	?
Utilities (\$0.05)	<u>195</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total variable overhead costs	<u>\$2,340</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Fixed overhead costs					
Depreciation—machinery	\$ 500	?	?	?	?
Depreciation—building	700	?	?	?	?
Supervision	1,800	?	?	?	?
Maintenance and repairs	400	?	?	?	?
Other overhead expenses	<u>600</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total fixed overhead costs	<u>\$4,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total overhead costs	<u>\$6,340</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

Note: The figures in parentheses are variable costs per unit.

6. Selling and Administrative Expense Budget:

Bertha's Bathworks Selling and Administrative Expense Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Variable selling and administrative expenses					
Delivery expenses (\$0.10)	\$ 400	?	?	?	?
Sales commissions (\$0.15)	600	?	?	?	?
Accounting (\$0.05)	200	?	?	?	?
Other administrative expenses (\$0.20)	<u>800</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total variable selling and administrative expenses	<u>\$2,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Fixed selling and administrative expenses					
Sales salaries	\$5,000	?	?	?	?
Depreciation, office equipment	900	?	?	?	?
Taxes and insurance	<u>1,700</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total fixed selling and administrative expenses	<u>\$7,600</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total selling and administrative expenses	<u>\$9,600</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

Note: The figures in parentheses are variable costs per unit.

7. Cost of Goods Manufactured Budget:

Bertha's Bathworks	
Cost of Goods Manufactured Budget	
For the Year Ended December 31	
Direct materials used	
Direct materials inventory, beginning	?
Purchases during the year	<u>?</u>
Cost of direct materials available for use	?
Less direct materials inventory, ending	<u>?</u>
Cost of direct materials used	?
Direct labor costs	?
Overhead costs	<u>?</u>
Total manufacturing costs	?
Work in process inventory, beginning	?
Less work in process inventory, ending*	<u>?</u>
Cost of goods manufactured	<u>?</u>
Manufactured Cost per Unit = Cost of Goods	
Manufactured ÷ Units Produced	?

*It is the company's policy to have no units in process at the end of the year.

8. Budgeted Income Statement:

Bertha's Bathworks	
Budgeted Income Statement	
For the Year Ended December 31	
Sales	?
Cost of goods sold	
Finished goods inventory, beginning	?
Cost of goods manufactured	<u>?</u>
Cost of goods available for sale	?
Less finished goods inventory, ending	<u>?</u>
Cost of goods sold	<u>?</u>
Gross margin	?
Selling and administrative expenses	<u>?</u>
Income from operations	?
Income taxes expense (30%)*	<u>?</u>
Net income	<u>?</u>

*The figure in parentheses is the company's income tax rate.

LO4 Basic Cash Budget

P 3. Felasco Nurseries, Inc., has been in business for six years and has four divisions. Ethan Poulis, the corporation's controller, has been asked to prepare a cash budget for the Southern Division for the first quarter. Projected data supporting this budget follow.

Sales (60% on credit)		Purchases	
November	\$160,000	December	\$ 86,800
December	200,000	January	124,700
January	120,000	February	99,440
February	160,000	March	104,800
March	140,000		

Collection records of accounts receivable have shown that 30 percent of all credit sales are collected in the month of sale, 60 percent in the month following the sale, and 8 percent in the second month following the sale; 2 percent of the sales are uncollectible. All purchases are paid for in the month after the purchase. Salaries and wages are projected to be \$25,200 in January, \$33,200 in February, and \$21,200 in March. Estimated monthly costs are utilities, \$4,220; collection fees, \$1,700; rent, \$5,300; equipment depreciation, \$5,440; supplies, \$2,480; small tools, \$3,140; and miscellaneous, \$1,900.

Each of the corporation's divisions maintains a \$6,000 minimum cash balance. As of December 31, the Southern Division had a cash balance of \$9,600.

Required

- Manager insight** ▶
1. Prepare a monthly cash budget for Felasco Nurseries' Southern Division for the first quarter.
 2. Should Felasco Nurseries anticipate taking out a loan for the Southern Division during the quarter? If so, how much should it borrow, and when?

LO4 Cash Budget

P 4. Security Services Company provides security monitoring services. It employs five security specialists. Each specialist works an average of 160 hours a month. The company's controller has compiled the following information:

	Actual Data for Last Year		Forecasted Data for Next Year		
	November	December	January	February	March
Security billings (sales)	\$30,000	\$35,000	\$25,000	\$20,000	\$30,000
Selling and administrative expenses	10,000	11,000	9,000	8,000	10,500
Operating supplies	2,500	3,500	2,500	2,000	3,000
Service overhead	3,000	3,500	3,000	2,500	3,000

Sixty percent of the client billings are cash sales collected during the month of sale; 30 percent are collected in the first month following the sale; and 10 percent are collected in the second month following the sale. Operating supplies are paid for in the month of purchase. Selling and administrative expenses and service overhead are paid in the month following the cost's incurrence.

The company has a bank loan of \$12,000 at a 12 percent annual interest rate. Interest is paid monthly, and \$2,000 of the loan principal is due on February 28. Income taxes of \$4,500 for the last calendar year are due and payable on March 15. The five security specialists each earn \$8.50 an hour, and all payroll-related employee benefit costs are included in service overhead. The company anticipates no capital expenditures for the first quarter of the coming year. It expects its cash balance on December 31 to be \$13,000.

Required

Prepare a monthly cash budget for Security Services Company for the three-month period ended March 31.

L04 Budgeted Income Statement and Budgeted Balance Sheet

P 5. Moontrust Bank has asked the president of Wishware Products, Inc., for a budgeted income statement and budgeted balance sheet for the quarter ended June 30. These pro forma financial statements are needed to support Wishware Products' request for a loan.

Wishware Products routinely prepares a quarterly master budget. The operating budgets prepared for the quarter ending June 30 have provided the following information: Projected sales for April are \$220,400; for May, \$164,220; and for June, \$165,980. Direct materials purchases for the period are estimated at \$96,840; direct materials usage, at \$102,710; direct labor expenses, at \$71,460; overhead, at \$79,940; selling and administrative expenses, at \$143,740; capital expenditures, at \$125,000 (to be spent on June 29); cost of goods manufactured, at \$252,880; and cost of goods sold, at \$251,700.

Balance sheet account balances at March 31 were as follows: Accounts Receivable, \$26,500; Materials Inventory, \$23,910; Work in Process Inventory, \$31,620; Finished Goods Inventory, \$36,220; Prepaid Expenses, \$7,200; Plant, Furniture, and Fixtures, \$498,600; Accumulated Depreciation—Plant, Furniture, and Fixtures, \$141,162; Patents, \$90,600; Accounts Payable, \$39,600; Notes Payable, \$105,500; Common Stock, \$250,000; and Retained Earnings, \$207,158.

Projected monthly cash balances for the second quarter are as follows: April 30, \$20,490; May 31, \$35,610; and June 30, \$45,400. During the quarter, accounts receivable are expected to increase by 30 percent, patents to go up by \$6,500, prepaid expenses to remain constant, and accounts payable to go down by 10 percent (Wishware Products will make a \$5,000 payment on a note payable, \$4,100 of which is principal reduction). The federal income tax rate is 34 percent, and the second quarter's tax is paid in July. Depreciation for the quarter will be \$6,420, which is included in the overhead budget. The company will pay no dividends.

Required

1. Prepare a budgeted income statement for the quarter ended June 30. Round answers to the nearest dollar.
2. Prepare a budgeted balance sheet as of June 30.

Alternate Problems**L03 Preparing Operating Budgets**

P 6. The principal product of Waterworks, Inc., is a metal water bottle that carries a lifetime guarantee. Listed here are cost and production data for the water bottle.

Direct materials

Stainless steel: 0.25 kilogram per bottle at \$8.00 per kilogram

Clip for the handle: 1 per bottle at \$0.10 each

Direct labor

Stamping operation: \$30 per labor hour; 2 minutes per bottle

Overhead

Stamping operation: rate equals 70 percent of department's direct labor dollars

In January, February, and March, Waterworks expects to produce 200,000, 225,000, and 150,000 bottles, respectively. The company has no beginning or ending balances of direct materials inventory or work in process inventory for the year.

Required

1. For the three-month period ending March 31, prepare monthly production cost information for the metal water bottle. Classify the costs as direct materials, direct labor, or overhead, and show your computations.
2. Prepare a cost of goods manufactured budget for the water bottle. Show monthly cost data and combined totals for the quarter for each cost category.

L03 L04 Preparing a Comprehensive Budget

P 7. The Bottled Water Company has been bottling and selling water since 1940. Ginnie Adams, the current owner of The Bottled Water Company, would like to know how a new product would affect the company's net income in the coming year.

Required

Calculate The Bottled Water Company's net income for the new product in the coming year by completing the operating budgets and budgeted income statement that follow.

1. Sales Budget:

The Bottled Water Company					
Sales Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Sales in units	40,000	30,000	50,000	55,000	175,000
× Selling price per unit	× \$1	× ?	× ?	× ?	× ?
Total sales	<u>\$40,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

2. Production Budget:

The Bottled Water Company					
Production Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Sales in units	40,000	?	?	?	?
Plus desired units of ending finished goods inventory*	<u>3,000</u>	<u>?</u>	<u>?</u>	<u>6,000</u>	<u>6,000</u>
Desired total units	43,000				
Less desired units of beginning finished goods inventory†	<u>4,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>4,000</u>
Total production units	<u>39,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

*Desired units of ending finished goods inventory = 10% of next quarter's budgeted sales.

†Desired units of beginning finished goods inventory = 10% of current quarter's budgeted sales.

3. Direct Materials Purchases Budget:

The Bottled Water Company					
Direct Materials Purchases Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Total production units	39,000	32,000	50,500	55,500	?
× 20 ounces per unit	× 20	× ?	× ?	× ?	× ?
Total production needs in ounces	780,000	?	?	?	?
Plus desired ounces of ending direct materials inventory*	128,000	?	?	240,000	240,000
	908,000	?	?	?	?
Less desired ounces of beginning direct materials inventory†	156,000	?	?	?	156,000
Total ounces of direct materials to be purchased	752,000	?	?	?	?
× Cost per ounce	× \$0.01	× ?	× ?	× ?	× ?
Total cost of direct materials purchases	\$ 7,520	?	?	?	?

*Desired ounces of ending direct materials inventory = 20% of next quarter's budgeted production needs in ounces.

†Desired ounces of beginning direct materials inventory = 20% of current quarter's budgeted production needs in ounces.

4. Direct Labor Budget:

The Bottled Water Company					
Direct Labor Budget					
For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Total production units	39,000	?	?	?	?
× Direct labor hours per unit	× 0.001	× ?	× ?	× ?	× ?
Total direct labor hours	39.0	?	?	?	?
× Direct labor cost per hour	× \$8	× ?	× ?	× ?	× ?
Total direct labor cost	\$ 312	?	?	?	?

5. Overhead Budget:

The Bottled Water Company Overhead Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Variable overhead costs					
Factory supplies (\$0.01)	\$ 390	?	?	?	?
Employee benefits (\$0.05)	1,950	?	?	?	?
Inspection (\$0.01)	390	?	?	?	?
Maintenance and repairs (\$0.02)	780	?	?	?	?
Utilities (\$0.01)	<u>390</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total variable overhead costs	\$3,900	?	?	?	?
Total fixed overhead costs	<u>1,500</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total overhead costs	<u>\$5,400</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

Note: The figures in parentheses are variable costs per unit.

6. Selling and Administrative Expense Budget:

The Bottled Water Company Selling and Administrative Expense Budget For the Year Ended December 31					
	Quarter				Year
	1	2	3	4	
Variable selling and administrative expenses					
Delivery expenses (\$0.01)	\$ 400	?	?	?	?
Sales commissions (\$0.02)	800	?	?	?	?
Accounting (\$0.01)	400	?	?	?	?
Other administrative expenses (\$0.01)	<u>400</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total variable selling and administrative expenses	\$2,000	?	?	?	?
Total fixed selling and administrative expenses	<u>5,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>
Total selling and administrative expenses	<u>\$7,000</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

Note: The figures in parentheses are variable costs per unit.

7. Cost of Goods Manufactured Budget:

The Bottled Water Company		
Cost of Goods Manufactured Budget		
For the Year Ended December 31		
Direct materials used		
Direct materials inventory, beginning	?	
Purchases during the year	<u>?</u>	
Cost of direct materials available for use	<u>?</u>	
Less direct materials inventory, ending		<u>?</u>
Cost of direct materials used		?
Direct labor costs		?
Overhead costs		<u>?</u>
Total manufacturing costs		?
Work in process inventory, beginning*		0
Less work in process inventory, ending*		<u>0</u>
Cost of goods manufactured		<u>?</u>
Manufactured Cost per Unit = Cost of Goods Manufactured ÷ Units Produced		?

*It is the company's policy to have no units in process at the end of the year.

8. Budgeted Income Statement:

The Bottled Water Company		
Budgeted Income Statement		
For the Year Ended December 31		
Sales		?
Cost of goods sold		
Finished goods inventory, beginning	?	
Cost of goods manufactured	<u>?</u>	
Cost of goods available for sale	<u>?</u>	
Less finished goods inventory, ending		<u>?</u>
Cost of goods sold		<u>?</u>
Gross margin		?
Selling and administrative expenses		<u>?</u>
Income from operations		?
Income taxes expense (30%)*		<u>?</u>
Net income		<u>?</u>

*The figure in parentheses is the company's income tax rate.

LO4 Comprehensive Cash Budget

P8. Located in Telluride, Colorado, Wellness Centers, Inc., emphasizes the benefits of regular workouts and the importance of physical examinations. The corporation operates three fully equipped fitness centers, as well as a medical center that specializes in preventive medicine. The data that follow pertain to the corporation's first quarter.

Cash Receipts

Memberships: December, 870; January, 880; February, 910; March, 1,030

Membership dues: \$90 per month, payable on the 10th of the month

(80 percent collected on time; 20 percent collected one month late)

Medical examinations: January, \$35,610; February, \$41,840; March, \$45,610

Special aerobics classes: January, \$4,020; February, \$5,130; March, \$7,130

High-protein food sales: January, \$4,890; February, \$5,130; March, \$6,280

Cash Payments

Salaries and wages:

Corporate officers: 2 at \$12,000 per month

Physicians: 2 at \$7,000 per month

Nurses: 3 at \$2,900 per month

Clerical staff: 2 at \$1,500 per month

Aerobics instructors: 3 at \$1,100 per month

Clinic staff: 6 at \$1,700 per month

Maintenance staff: 3 at \$900 per month

Health-food servers: 3 at \$750 per month

Purchases:

Muscle-toning machines: January, \$14,400; February, \$13,800

(no purchases in March)

Pool supplies: \$520 per month

Health food: January, \$3,290; February, \$3,460; March, \$3,720

Medical supplies: January, \$10,400; February, \$11,250; March, \$12,640

Medical uniforms and disposable garments: January, \$7,410; February, \$3,900; March, \$3,450

Medical equipment: January, \$11,200; February, \$3,400; March \$5,900

Advertising: January, \$2,250; February, \$1,190; March, \$2,450

Utilities expense: January, \$5,450; February, \$5,890; March, \$6,090

Insurance:

Fire: January, \$3,470

Liability: March, \$3,980

Property taxes: \$3,760 due in January

Federal income taxes: Last year's taxes of \$21,000 due in March

Miscellaneous: January, \$2,625; February, \$2,800; March, \$1,150

Wellness Centers' controller anticipates that the beginning cash balance on January 1 will be \$9,840.

Required

Prepare a cash budget for Wellness Centers, Inc., for the first quarter of the year. Use *January*, *February*, *March*, and *Quarter* as the column headings.

LO4 Cash Budget

P9. FM Company provides fraud monitoring services. It employs four fraud specialists. Each specialist works an average of 200 hours a month. The company's controller has compiled the following information:

	Actual Data for Last Year		Forecasted Data for Next Year		
	November	December	January	February	March
Billings (sales)	\$100,000	\$80,000	\$60,000	\$50,000	\$70,000
Selling and administrative expenses	15,000	12,000	8,000	7,000	10,000
Operating supplies	2,500	3,500	2,500	2,000	3,000
Service overhead	14,000	13,500	13,000	12,500	13,000

Seventy percent of the client billings are cash sales collected during the month of sale; 20 percent are collected in the first month following the sale; and 10 percent are collected in the second month following the sale. Operating supplies are paid in the month of purchase. Selling and administrative expenses and service overhead are paid in the month the cost is incurred.

The company has a bank loan of \$12,000 at a 6 percent annual interest rate. Interest is paid monthly, and \$2,000 of the loan principal is due on February 28. Income taxes of \$6,500 for last calendar year are due and payable on March 15. The four security specialists each earn \$48.00 an hour, and all payroll-related employee benefit costs are included in service overhead. The company anticipates no capital expenditures for the first quarter of the coming year. It expects its cash balance on December 31 to be \$10,000.

Required

Prepare a monthly cash budget for FM Company for the three-month period ended March 31.

LO4 Budgeted Income Statement and Budgeted Balance Sheet

P 10. Stillwater Video Company, Inc., produces and markets two popular video games, *High Range* and *Star Boundary*. The closing account balances on the company's balance sheet for last year are as follows: Cash, \$18,735; Accounts Receivable, \$19,900; Materials Inventory, \$18,510; Work in Process Inventory, \$24,680; Finished Goods Inventory, \$21,940; Prepaid Expenses, \$3,420; Plant and Equipment, \$262,800; Accumulated Depreciation—Plant and Equipment, \$55,845; Other Assets, \$9,480; Accounts Payable, \$52,640; Mortgage Payable, \$70,000; Common Stock, \$90,000; and Retained Earnings, \$110,980.

Operating budgets for the first quarter of the coming year show the following estimated costs: direct materials purchases, \$58,100; direct materials usage, \$62,400; direct labor expense, \$42,880; overhead, \$51,910; selling expenses, \$35,820; general and administrative expenses, \$60,240; cost of goods manufactured, \$163,990; and cost of goods sold, \$165,440. Estimated ending cash balances are as follows: January, \$34,610; February, \$60,190; and March, \$54,802. The company will have no capital expenditures during the quarter.

Sales are projected to be \$125,200 in January, \$105,100 in February, and \$112,600 in March. Accounts receivable are expected to double during the quarter, and accounts payable are expected to decrease by 20 percent. Mortgage payments for the quarter will total \$6,000, of which \$2,000 will be interest expense. Prepaid expenses are expected to go up by \$20,000, and other assets are projected to increase by 50 percent over the budget period. Depreciation for plant and equipment (already included in the overhead budget) averages 5 percent of total plant and equipment per year. Federal income taxes (34 percent of profits) are payable in April. The company pays no dividends.

Required

1. Prepare a budgeted income statement for the quarter ended March 31.
2. Prepare a budgeted balance sheet as of March 31.

ENHANCING Your Knowledge, Skills, and Critical Thinking

L01 L02 Policies for Budget Development

C 1. Hector Corporation is a manufacturing company with annual sales of \$25 million. Its budget committee has created the following policy that the company uses each year in developing its master budget for the following calendar year:

May	The company's controller and other members of the budget committee meet to discuss plans and objectives for next year. The controller conveys all relevant information from this meeting to division managers and department heads.
June	Division managers, department heads, and the controller meet to discuss the corporate plans and objectives for next year. They develop a timetable for developing next year's budget data.
July	Division managers and department heads develop budget data. The vice president of sales provides them with final sales estimates, and they complete monthly sales estimates for each product line.
August	Estimates of next year's monthly production activity and inventory levels are completed. Division managers and department heads communicate these estimates to the controller, who distributes them to other operating areas.
September	All operating areas submit their revised budget data. The controller integrates their labor requirements, direct materials requirements, unit cost estimates, cash requirements, and profit estimates into a preliminary master budget.
October	The budget committee meets to discuss the preliminary master budget and to make any necessary corrections, additions, or deletions. The controller incorporates all authorized changes into a final draft of the master budget.
November	The controller submits the final draft to the budget committee for approval. If the committee approves it, it is distributed to all corporate officers, division managers, and department heads.

1. Comment on this policy.
2. What changes would you recommend?

L01 L03 Ethical Considerations in Budgeting

C 2. Javier Gonzales is the manager of the Repairs and Maintenance Department of JG Industries. He is responsible for preparing his department's annual budget. Most managers in the company inflate their budget numbers by at least 10 percent because their bonuses depend upon how much below budget their departments operate. Gonzales turned in the following information for his department's budget for next year to the company's budget committee:

	Budget This Year	Actual This Year	Budget Next Year
Supplies	\$ 20,000	\$ 16,000	\$ 24,000
Labor	80,000	82,000	96,000
Utilities	8,500	8,000	10,200
Tools	12,500	9,000	15,000
Hand-carried equipment	25,000	16,400	30,000
Cleaning materials	4,600	4,200	5,520
Miscellaneous	2,000	2,100	2,400
Totals	<u>\$152,600</u>	<u>\$137,700</u>	<u>\$183,120</u>

Because the figures for next year are 20 percent above those in this year's budget, the budget committee questioned them. Gonzales defended them by saying that he expects a significant increase in activity in his department next year.

What do you think are the real reasons for the increase in the budgeted amounts? What ethical considerations enter into this situation?

L04 Budgeting for Cash Flows

C 3. The nature of a company's business affects its need to budget for cash flows. **H&R Block** is a service company whose main business is preparing tax returns. Most tax returns are prepared after January 31 and before April 15. For a fee and interest, the company will advance cash to clients who are due refunds. The clients are expected to repay the cash advances when they receive their refunds. Although H&R Block has some revenues throughout the year, it devotes most of the nontax season to training potential employees in tax preparation procedures and to laying the groundwork for the next tax season.

Toys "R" Us is a toy retailer whose sales are concentrated in October, November, and December of one year and January of the next year. Sales continue at a steady but low level during the rest of the year. The company purchases most of its inventory between July and September.

Johnson & Johnson sells the many health care products that it manufactures to retailers, and the retailers sell them to the final customer. Johnson & Johnson offers retailers credit terms.

Discuss the nature of cash receipts and cash disbursements over a calendar year in the three companies we have just described. What are some key estimates that the management of these companies must make when preparing a cash budget?

L01 L04 Budgeting Procedures

C 4. Since Rood Enterprises inaugurated participative budgeting 10 years ago, everyone in the organization—from maintenance personnel to the president's staff—has had a voice in the budgeting process. Until recently, participative budgeting has worked in the best interests of the company as a whole. Now, however, it is becoming evident that some managers are using the practice solely to benefit their own divisions. The budget committee has therefore asked you, the company's controller, to analyze this year's divisional budgets carefully before incorporating them into the company's master budget.

The Motor Division was the first of the company's six divisions to submit its budget request for next year. The division's budgeted income statement appears at the top of the next page.

Rood Enterprises
Motor Division
Budgeted Income Statement
For the Years Ended December 31

	Budget for This Year	Budget for Next Year	Increase (Decrease)
Net sales			
Radios	\$ 850,000	\$ 910,000	\$ 60,000
Appliances	680,000	740,000	60,000
Telephones	270,000	305,000	35,000
Miscellaneous	84,400	90,000	5,600
Net sales	<u>\$1,884,400</u>	<u>\$2,045,000</u>	<u>\$160,600</u>
Less cost of goods sold	<u>750,960</u>	<u>717,500*</u>	<u>(33,460)</u>
Gross margin	<u>\$1,133,440</u>	<u>\$1,327,500</u>	<u>\$194,060</u>
Operating expenses			
Wages			
Warehouse	\$ 94,500	\$ 102,250	\$ 7,750
Purchasing	77,800	84,000	6,200
Delivery/shipping	69,400	74,780	5,380
Maintenance	42,650	45,670	3,020
Salaries			
Supervisory	60,000	92,250	32,250
Executive	130,000	164,000	34,000
Purchases, supplies	17,400	20,500	3,100
Maintenance	72,400	82,000	9,600
Depreciation	62,000	74,750 [†]	12,750
Building rent	96,000	102,500	6,500
Sales commissions	188,440	204,500	16,060
Insurance			
Fire	12,670	20,500	7,830
Liability	18,200	20,500	2,300
Utilities	14,100	15,375	1,275
Taxes			
Property	16,600	18,450	1,850
Payroll	26,520	41,000	14,480
Miscellaneous	4,610	10,250	5,640
Total operating expenses	<u>\$1,003,290</u>	<u>\$1,173,275</u>	<u>\$169,985</u>
Income from operations	<u>\$ 130,150</u>	<u>\$ 154,225</u>	<u>\$ 24,075</u>

*Less expensive merchandise will be purchased in the next year to boost profits.

[†]Depreciation is increased because additional equipment must be bought to handle increased sales.

1. Recast the Motor Division's budgeted income statement in the following format (round percentages to two places):

Account	Budget for This Year		Budget for Next Year	
	Amount	Percentage of Net Sales	Amount	Percentage of Net Sales

2. Actual results for this year revealed the following information about revenues and cost of goods sold:

	Amount	Percentage of Net Sales
Net sales		
Radios	\$ 780,000	43.94
Appliances	640,000	36.06
Telephones	280,000	15.77
Miscellaneous	75,000	4.23
Net sales	<u>\$1,775,000</u>	<u>100.00</u>
Less cost of goods sold	<u>763,425</u>	<u>43.01</u>
Gross margin	<u>\$1,011,575</u>	<u>56.99</u>

On the basis of this information and your analysis in **1**, what do you think the budget committee should say to the managers of the Motor Division? Identify any specific areas of the budget that may need to be revised, and explain why the revision is needed.

L03 L04 The Budgeting Process

C 5. Refer to our development of Framecraft Company's master budget in this chapter. Suppose that because of a new customer in Canada, the company's management has decided to increase budgeted sales in the first quarter by 5,000 units. The expenses for this sale will include direct materials, direct labor, variable overhead, and variable selling and administrative expenses. The delivery expense for the Canadian customer will be \$0.18 per unit rather than the regular \$0.08 per unit. The desired units of beginning finished goods inventory will remain at 1,000 units.

- Using an Excel spreadsheet, revise Framecraft Company's budgeted income statement and the operating budgets that support it to reflect the changes described above. (Round manufactured cost per unit to three decimals.)
- What was the change in income from operations? Would you recommend accepting the order from the Canadian customer? If so, why?

L01 L02 L04 Cookie Company (Continuing Case)

C 6. In this segment of our continuing case, you have decided to open a store where you will sell your company's cookies, as well as coffee, tea, and other beverages. You believe that the store will be able to provide excellent service and undersell the local competition. To fund operations, you are applying for a loan from the Small Business Administration. The loan application requires you to submit two financial budgets—a pro forma income statement and a pro forma balance sheet—within six weeks.

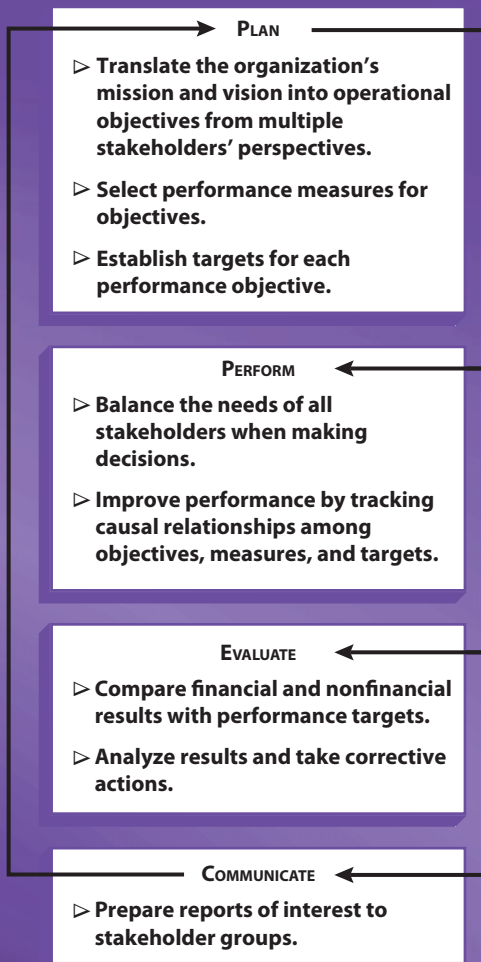
How do the four *w*'s of preparing an accounting report apply in this situation—that is, *why* are you preparing these financial budgets, *who* needs them, *what* information do you need to prepare them, and *when* are they due?

CHAPTER

8

Performance Management and Evaluation

The Management Process



Managers use multiple evaluation metrics to analyze and manage performance.

If managers want satisfactory results, they must understand the cause-and-effect relationships between their actions and their organization's overall performance. By measuring and tracking the relationships that they are responsible for, managers can improve performance and thereby add value for all of their organization's stakeholders. In this chapter, we describe the role of the balanced scorecard, responsibility accounting, and economic value added as they relate to performance management and evaluation. We also point out how managers can use a wide range of financial and nonfinancial data to manage and evaluate performance more effectively.

LEARNING OBJECTIVES

- L01** Define a *performance management and evaluation system*, and describe how the balanced scorecard aligns performance with organizational goals. (pp. 302–305)
- L02** Define *responsibility accounting*, and describe the role that responsibility centers play in performance management and evaluation. (pp. 305–309)
- L03** Prepare performance reports for cost centers using flexible budgets and for profit centers using variable costing. (pp. 310–313)
- L04** Prepare performance reports for investment centers using the traditional measures of return on investment and residual income and the newer measure of economic value added. (pp. 313–319)
- L05** Explain how properly linked performance incentives and measures add value for all stakeholders in performance management and evaluation. (pp. 319–322)

DECISION POINT ► A MANAGER'S FOCUS VAIL RESORTS

Vail Resorts includes five vacation spots: Vail, Breckenridge, Keystone, Heavenly, and Beaver Creek. To help guests enjoy all the activities that these places offer, Vail Resorts instituted its PEAKS system. PEAKS is an all-in-one card that guests at the five resort areas can use to pay for lift tickets, skiing and snowboarding lessons, equipment rentals, dining, and more.

Guests like the PEAKS system's convenience and its program for earning points toward free or reduced-rate lift tickets, dining, and lodging. After enrolling, members receive a picture identification card with radio frequency technology that is scanned each time they ride the ski lifts, attend ski school, or charge purchases, meals, or lodging.¹

Managers at Vail Resorts like the PEAKS system because it enables them to collect huge amounts of information—both financial and nonfinancial—in a simple way and because the data have so many uses. New data are entered in the system each time a guest's card is scanned. Those data then become part of an integrated management information system that managers use to measure and evaluate the performance of their resorts in many ways.

- How do managers at Vail Resorts link performance measures and set performance targets to achieve performance objectives?
- How do they use the PEAKS system and its integrated database to improve performance management and evaluation?



Performance Measurement

LO1 Define a *performance management and evaluation system*, and describe how the balanced scorecard aligns performance with organizational goals.

Study Note

What a manager measures for example, quality—is not the same as the actual measures used to monitor performance—for example, the number of defective units per hour.

A **performance management and evaluation system** is a set of procedures that account for and report on both financial and nonfinancial performance so that a company can identify how well it is doing, where it is going, and what improvements will make it more profitable.

What to Measure, How to Measure

Performance measurement is the use of quantitative tools to gauge an organization's performance in relation to a specific goal or an expected outcome. For performance measurement to succeed, managers must be able to distinguish between what is being measured and the actual measures used to monitor performance. For instance, product or service quality is not a performance measure. It is part of a management strategy: Management wants to produce the highest-quality product or service possible, given the resources available. Product or service quality thus is what management wants to measure.

To measure product or service quality, managers must collaborate with other managers to develop a group of measures, such as the balanced scorecard, that will identify changes in product or service quality and help employees determine what needs to be done to improve quality.

Other Measurement Issues

Each organization must develop a set of performance measures that is appropriate to its situation. In addition to answering the basic questions of what to measure and how to measure, management must consider a variety of other issues, including the following:

- ▶ What performance measures can be used?
- ▶ How can managers monitor the level of product or service quality?
- ▶ How can managers monitor production and other business processes to identify areas that need improvement?
- ▶ How can managers measure customer satisfaction?
- ▶ How can managers monitor financial performance?
- ▶ Are there other stakeholders to whom a manager is accountable?
- ▶ What performance measures do government entities impose on the company?
- ▶ How can a manager measure the company's effect on the environment?



FOCUS ON BUSINESS PRACTICE

"Old" Doesn't Mean "Out of Date"

The *tableau de bord*, or "dashboard," was developed by French engineers around 1900 as a concise performance measurement system that helped managers understand the cause-and-effect relationships between their decisions and the resulting performance. The indicators, both financial and nonfinancial, allowed managers at all levels to monitor their progress in terms of the

mission and objectives of their unit and of their company overall. Like a set of nested Russian dolls, each unit's key success factors and key performance indicators were integrated with those of other units. The dashboard continues to encourage a performance measurement system that focuses on and supports an organization's strategic plan.²

Organizational Goals and the Balanced Scorecard

The **balanced scorecard**, developed by Robert S. Kaplan and David R Norton, is a framework that links the perspectives of an organization's four basic stakeholder groups—financial (investors), learning and growth (employees), internal business processes, and customers—with the organization's mission and vision, performance measures, strategic and tactical plans, and resources. To succeed, an organization must add value for all groups in both the short and the long term. Thus, an organization will determine each group's objectives and translate them into performance measures that have specific, quantifiable performance targets. Ideally, managers should be able to see how their actions contribute to the achievement of organizational goals and understand how their compensation is related to their actions. The balanced scorecard assumes that an organization will get only what it measures.

The Balanced Scorecard and Management

To illustrate how managers use the balanced scorecard, we will refer to **Vail Resorts'** PEAKS system, which we described in the Decision Point.

Planning During the planning stage, the balanced scorecard provides a framework that enables managers to translate their organization's vision and strategy into operational terms. Managers evaluate the company's vision from the perspective of each stakeholder group and seek to answer one key question for each group:

- ▶ **Financial (investors):** To achieve our organization's vision, how should we appear to our shareholders?
- ▶ **Learning and growth (employees):** To achieve our organization's vision, how should we sustain our ability to improve and change?
- ▶ **Internal business processes:** To succeed, in which business processes must our organization excel?
- ▶ **Customers:** To achieve our organization's vision, how should we appeal to our customers?

Study Note

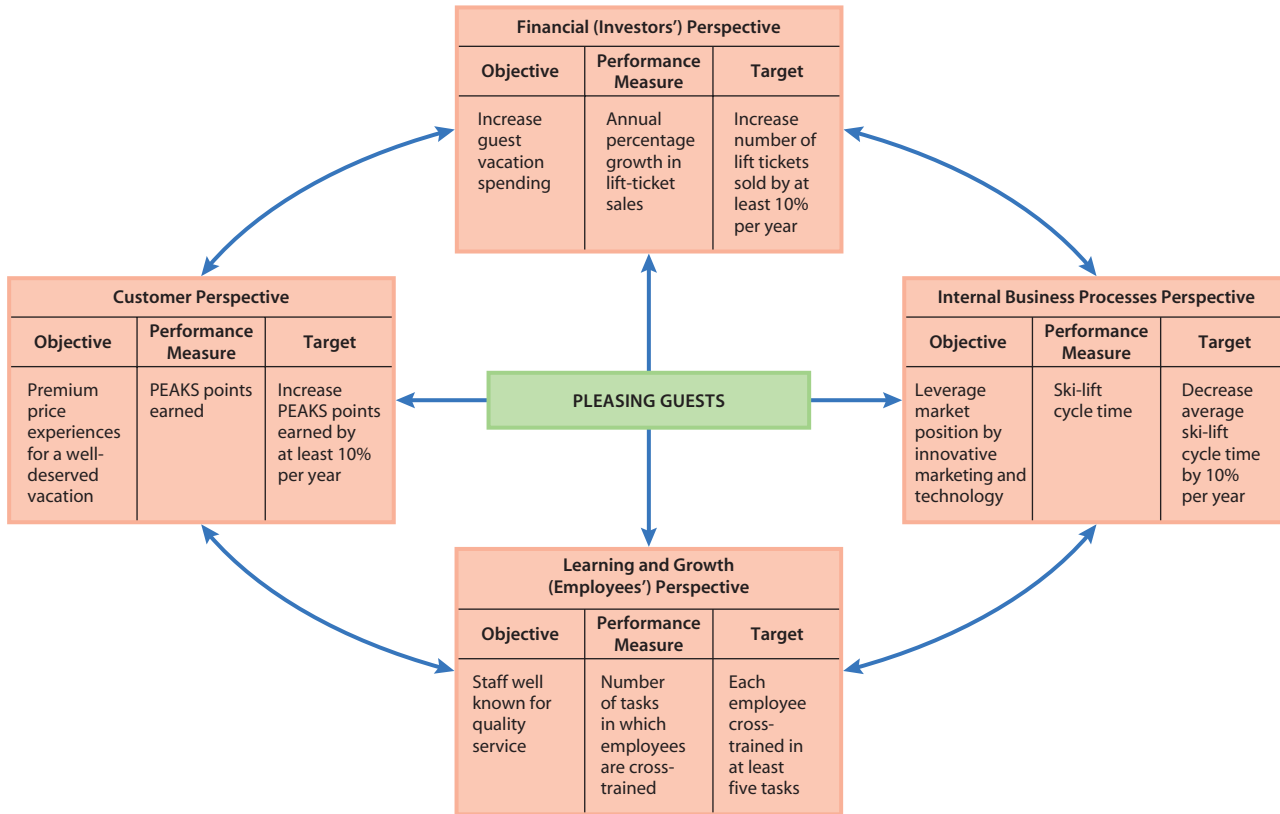
The alignment of an organization's strategy with all the perspectives of the balanced scorecard results in performance objectives that benefit all stakeholders.

These key questions align the organization's strategy from all perspectives. The answers to the questions result in performance objectives that are mutually beneficial to all stakeholders. Once the organization's objectives are set, managers can select performance measures and set performance targets to translate the objectives into an action plan. For example, if Vail Resorts' collective vision and strategy is to please guests, its managers might establish the following overall objectives:

<i>Perspective</i>	<i>Objective</i>
Financial (investors)	Increase guests' spending at the resort.
Learning and growth (employees)	Continually cross-train employees in each other's duties to sustain premium-quality service for guests.
Internal business processes	Leverage market position by introducing and improving innovative marketing and technology-driven advances that clearly benefit guests.
Customers	Create new premium-price experiences and facilities for vacations in all seasons.

These overall objectives are then translated into specific performance objectives and measures for specific managers. Figure 8-1 summarizes how Vail

FIGURE 8-1 Sample Balanced Scorecard of Linked Objectives, Performance Measures, and Targets



Source: Adapted from Robert S. Kaplan and David P. Norton, "Using the Balanced Scorecard as a Strategic Management System," *Harvard Business Review*, January–February 1996.

Resort’s managers might link their organization’s vision and strategy to objectives, then link the objectives to logical performance measures, and, finally, set performance targets for a ski lift manager. As a result, a ski lift manager will have a variety of performance measures that balance the perspectives and needs of all stakeholders.

Performing Managers use the mutually agreed-upon strategic and tactical objectives for the entire organization as the basis for decision making within their individual areas of responsibility. This practice ensures that they consider the needs of all stakeholder groups and shows how measuring and managing performance for some stakeholder groups can lead to improved performance for another stakeholder group. Specifically, improving the performance of indicators like internal business processes and learning and growth will create improvements for customers, which in turn will result in improved financial performance. For example, when making decisions about available ski lift capacity, the ski lift manager at Vail Resorts will balance such factors as lift ticket sales, snow conditions, equipment reliability, trained staff availability, and length of wait for ski lifts.

When managers understand the causal and linked relationship between their actions and their company’s overall performance, they can see new ways to be more effective. For example, a ski lift manager may hypothesize that shorter waiting lines for the ski lifts would improve customer satisfaction and lead to more visits to the ski lift. The manager could test this possible cause-and-effect relationship by measuring and tracking the length of ski lift waiting lines and the number of visits to the ski lift. If a causal relationship exists, the manager can improve the

performance of the ski lift operation by doing everything possible to ensure that waiting lines are short because a quicker ride to the top will result in improved results for the operation and for other perspectives as well.

Evaluating Managers compare performance objectives and targets with actual results to determine if the targets were met, what measures need to be changed, and what strategies or objectives need revision. For example, the ski lift manager at Vail Resorts would analyze the reasons for performance gaps and make recommendations to improve the performance of the ski lift area.

Communicating A variety of reports enable managers to monitor and evaluate performance measures that add value for stakeholder groups. For example, the database makes it possible to prepare financial performance reports, customer PEAKS statements, internal business process reports for targeted performance measures and results, and performance appraisals of individual employees.

The balanced scorecard adds dimension to the management process. Managers plan, perform, evaluate, and communicate the organization's performance from multiple perspectives. By balancing the needs of all stakeholders, managers are more likely to achieve their objectives in both the short and the long term.

STOP & APPLY >

Molly Sams wants to measure customer satisfaction within her sales region. Link an appropriate performance measure with each balanced scorecard perspective.

Customer Satisfaction

1. Financial (investors)
2. Learning and growth (employees)
3. Internal business processes
4. Customers

Possible Performance Measures

- a. Number of cross-trained staff
- b. Customer satisfaction rating
- c. Time lapse from order to delivery
- d. Dollar sales to repeat customers

SOLUTION

1. d; 2. a; 3. c; 4. b

Responsibility Accounting

L02 Define *responsibility accounting*, and describe the role that responsibility centers play in performance management and evaluation.

As part of their performance management systems, many organizations assign resources to specific areas of responsibility and track how the managers of those areas use those resources. For example, **Vail Resorts** assigns resources to its Lodging, Dining, Retail and Rental, Ski School, and Real Estate divisions and holds the managers of those divisions responsible for generating revenue and managing costs. Within each division, other managers are assigned responsibility for such areas as Children and Adult Ski School, Snowboard School, or Private Lessons. All managers at all levels are then evaluated in terms of their ability to manage their areas of responsibility in keeping with the organization's goals.

To assist in performance management and evaluation, many organizations use responsibility accounting. **Responsibility accounting** is an information system that classifies data according to areas of responsibility and reports each area's activities by including only the revenue, cost, and resource categories that the

assigned manager can control. A **responsibility center** is an organizational unit whose manager has been assigned the responsibility of managing a portion of the organization's resources. The activities of a responsibility center dictate the extent of a manager's responsibility.

A report for a responsibility center should contain only the costs, revenues, and resources that the manager of that center can control. Such costs and revenues are called **controllable costs and revenues** because they are the result of a manager's actions, influence, or decisions. A responsibility accounting system ensures that managers will not be held responsible for items that they cannot change.

Types of Responsibility Centers

There are five types of responsibility centers: (1) cost centers, (2) discretionary cost centers, (3) revenue centers, (4) profit centers, and (5) investment centers. The key characteristics of the five types of responsibility centers are summarized in Table 8-1.

Cost Centers A responsibility center whose manager is accountable only for controllable costs that have well-defined relationships between the center's resources and certain products or services is called a **cost center**.

Manufacturing companies like **Apple Computer** use cost centers to manage assembly plants, where the relationship between the costs of resources (direct material, direct labor) and the resulting products is well defined. Service organizations use cost centers to manage activities in which resources are clearly linked with a service that is provided at no additional charge. For example, in nursing

Research and development units, such as the one shown here, are a type of discretionary cost center in which a manager is accountable for costs only and the relationship between resources and products or services produced is not well defined. A common performance measure used to evaluate research and development activities is the number of patents obtained.

Courtesy of Image Source/Getty Images.



TABLE 8-1
Types of Responsibility Centers

Responsibility Center	Manager Accountable For	How Performance Is Measured	Examples
Cost center	Only controllable costs, where there are well-defined links between the costs of resources and the resulting products or services	Compare actual costs with flexible and master budget costs Analyze resulting variances	Product: Manufacturing assembly plants Service: Food service for hospital patients
Discretionary cost center	Only controllable costs; the links between the costs of resources and the resulting products or services are <i>not</i> well defined	Compare actual noncost-based measures with targets Determine compliance with preapproved budgeted spending limits	Product or service: Administrative activities such as accounting, human resources, and research and development
Revenue center	Revenue generation	Compare actual revenue with budgeted revenue Analyze resulting variances	Product: Phone or e-commerce sales for pizza delivery Service: Reservation center on Internet
Profit center	Operating income resulting from controllable revenues and costs	Compare actual variable costing income statement with the budgeted income statement	Product or service: Local store of a national chain
Investment center	Controllable revenues, costs, and the investment of resources to achieve organizational goals	Return on investment Residual income Economic value added	Product: A division of a multinational corporation Service: A national office of a multinational consulting firm

homes and hospitals, there is a clear relationship between the costs of food and direct labor and the number of inpatient meals served.

The performance of a cost center is usually evaluated by comparing an activity's actual cost with its budgeted cost and analyzing the resulting variances. You will learn more about this performance evaluation process in the chapter on standard costing.

Discretionary Cost Centers A responsibility center whose manager is accountable for costs only and in which the relationship between resources and the products or services produced is not well defined is called a **discretionary cost center**. Departments that perform administrative activities, such as accounting, human resources, and legal services, are typical examples of discretionary cost centers. These centers, like cost centers, have approved budgets that set spending limits.

Because the spending and use of resources in discretionary cost centers are not clearly linked to the production of a product or service, cost-based measures usually cannot be used to evaluate performance (although such centers are penalized if they exceed their approved budgets). For example, among the performance measures used to evaluate the research and development activities are the number of patents obtained and the number of cost-saving innovations that are developed.

At service organizations, such as the **United Way**, a common measure of administrative activities is how low their costs are as a percentage of total contributions.

Revenue Centers A responsibility center whose manager is accountable primarily for revenue and whose success is based on its ability to generate revenue is called a **revenue center**. Examples of revenue centers are **Hertz**'s national car reservation center and the clothing retailer **Nordstrom**'s ecommerce order department.

A revenue center's performance is usually evaluated by comparing its actual revenue with its budgeted revenue and analyzing the resulting variances. Performance measures at both manufacturing and service organizations may include sales dollars, number of customer sales, or sales revenue per minute.

Profit Centers A responsibility center whose manager is accountable for both revenue and costs and for the resulting operating income is called a **profit center**. A good example is a local store of a national chain, such as **Wal-Mart** or **Jiffy Lube**.

The performance of a profit center is usually evaluated by comparing the figures on its actual income statement with the figures on its master or flexible budget income statement.

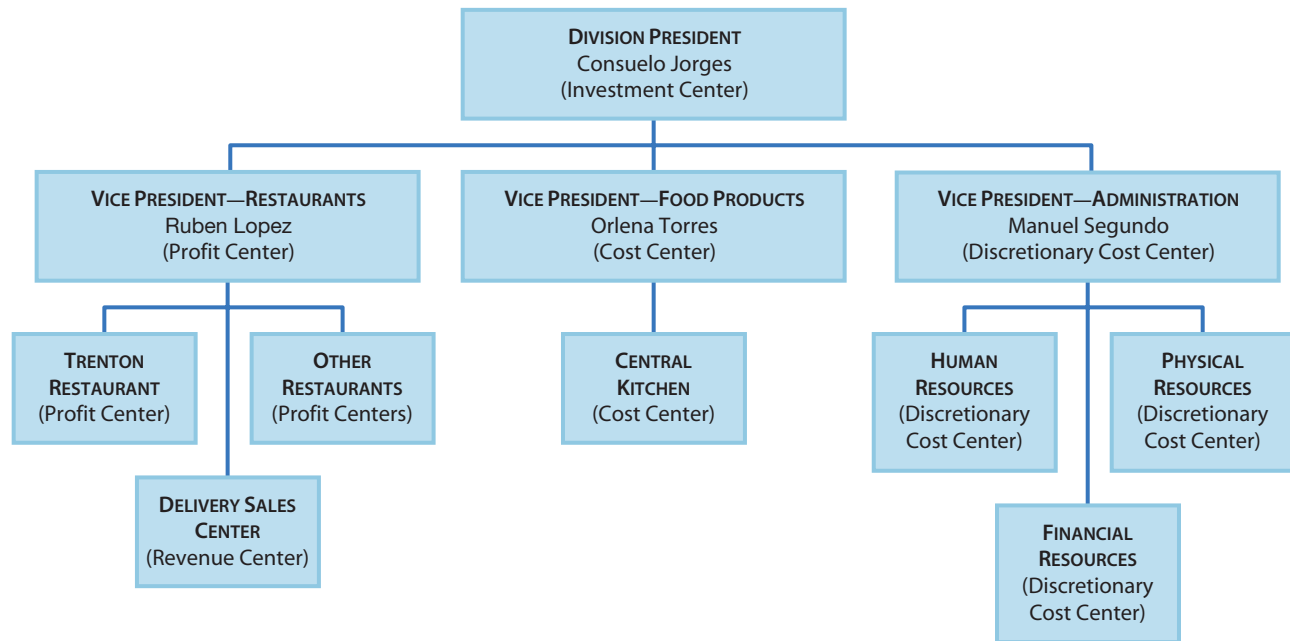
Investment Centers A responsibility center whose manager is accountable for profit generation and can also make significant decisions about the resources that the center uses is called an **investment center**. For example, the president of **Harley-Davidson**'s Buell subsidiary and the president of **Brinker International**'s Chili's Grill and Bar can control revenues, costs, and the investment of assets to achieve organizational goals.

The performance of these centers is evaluated using such measures as return on investment, residual income, and economic value added. These measures are used in all types of organizations, both manufacturing and nonmanufacturing, and are discussed later in this chapter.

Organizational Structure and Performance Management

Much can be learned about an organization by examining how its managers organize activities and resources. A company's organizational structure formalizes its lines of managerial authority and control. An **organization chart** is a visual representation of an organization's hierarchy of responsibility for the purposes of management control. Within an organization chart, the five types of responsibility centers are arranged by level of management authority and control.

By examining a typical corporate organization chart, you can see how a responsibility accounting system works. Figure 8-2 shows part of the management structure for the Restaurant Division of a major hospitality corporation. Notice that the figure shows examples of all five types of responsibility centers.

FIGURE 8-2 Partial Organization Chart of a Restaurant Division


In a responsibility accounting system, the performance reports for each level of management are tailored to each manager's individual needs for information. As information moves up the organizational chart, it is usually condensed. Performance reporting by responsibility level enables an organization to trace the source of a cost, revenue, or resource to the manager who controls it and to evaluate that manager's performance accordingly.

STOP & APPLY >

Identify the most appropriate type of responsibility center for each of the following organizational units:

- | | |
|------------------------------------------------|-------------------------------------------------|
| 1. A pizza store in a pizza chain | 4. A subsidiary of a business conglomerate |
| 2. The ticket sales center of a major airline | 5. The information technology area of a company |
| 3. The food service function at a nursing home | |

SOLUTION

- | | |
|-------------------|------------------------------|
| 1. Profit center | 4. Investment center |
| 2. Revenue center | 5. Discretionary cost center |
| 3. Cost center | |

Performance Evaluation of Cost Centers and Profit Centers

LO3 Prepare performance reports for cost centers using flexible budgets and for profit centers using variable costing.

Study Note

Only controllable items should be included on a manager's performance report.

Because performance reports contain information about costs, revenues, and resources that are controllable by individual managers, they allow comparisons between actual performance and budget expectations. Such comparisons allow management to evaluate an individual's performance with respect to responsibility center objectives and companywide objectives and to recommend changes. It is important to emphasize that performance reports should contain only costs, revenues, and resources that the manager can control. If a performance report includes items that the manager cannot control, the credibility of the entire responsibility accounting system can be called into question. It is up to management to structure and interpret the performance results fairly.

The content and format of a performance report depend on the nature of the responsibility center. Let us take a closer look at the performance reports for cost centers and profit centers.

Evaluating Cost Center Performance Using Flexible Budgeting

In the Restaurant Division whose organization is shown in Figure 8-2, the Central Kitchen is where the food products that the restaurants sell are prepared. It is a cost center because its costs have well-defined relationships with the resulting products, which are then transferred to the restaurants for further processing and sale. To ensure that the central kitchen is meeting its performance goals, the manager will evaluate the performance of each food item produced. A separate report on each product will compare its actual costs with the corresponding amounts from the budget.

The Central Kitchen's performance report on House Dressing is presented in Exhibit 8-1. It compares data from the master budget (prepared at the beginning of the period) with the actual results for the period. As you can see, actual costs exceeded budgeted costs. Most managers would consider such a cost overrun significant. But was there really a cost overrun? The amounts budgeted in the master budget are based on an output of 1,000 units of dressing; however, the actual output was 1,200 units of dressing.

To judge the central kitchen's performance accurately, the company's managers must change the budgeted data in the master budget to reflect an output of 1,200 units. They can do this by using a flexible budget.

A **flexible budget** (also called a *variable budget*) is a summary of expected costs for a range of activity levels. Unlike a static budget, a flexible budget provides forecasted data that can be adjusted for changes in the level of output.

- ▶ A flexible budget is derived by multiplying actual unit output by predetermined unit costs for each cost item in the report.
- ▶ The flexible budget is used primarily as a cost control tool in evaluating performance at the end of a period, as in Exhibit 8-1.

In the next chapter, you will learn that favorable (positive, or F) and unfavorable (negative, or U) variances between actual costs and the flexible budget can be further examined by using standard costing to compute specific variances for direct materials, direct labor, and variable and fixed overhead. Also, you will use the flexible budget as a cost control tool to evaluate performance.

EXHIBIT 8-1

Central Kitchen's Performance Report
on House Dressing

	Actual Results	Variance	Flexible Budget	Variance	Master Budget
Gallons produced	<u>1,200</u>	<u>0</u>	<u>1,200</u>	<u>200 (F)</u>	<u>1,000</u>
Center costs					
Direct materials (\$0.25 per gallon)	\$312	\$12 (U)	\$300	\$50 (U)	\$250
Direct labor (\$0.05 per gallon)	72	12 (U)	60	10 (U)	50
Variable overhead (\$0.03 per gallon)	33	3 (F)	36	6 (U)	30
Fixed overhead	<u>2</u>	<u>3 (F)</u>	<u>5</u>	<u>0</u>	<u>5</u>
Total cost	<u>\$419</u>	<u>\$18 (U)</u>	<u>\$401</u>	<u>\$66 (U)</u>	<u>\$335</u>
Performance measures					
Defect-free gallons to total produced	0.98	0.01 (U)	N/A	N/A	0.99
Average throughput time per gallon	11 minutes	1 minute (F)	N/A	N/A	12 minutes

Note: In this exhibit and others that appear later in this chapter, (F) indicates a favorable variance, and (U) indicates an unfavorable variance.

Evaluating Profit Center Performance Using Variable Costing

Restaurants are profit centers since each is accountable for its own revenues and costs and for the resulting operating income. A profit center's performance is usually evaluated by comparing its actual income statement results to its budgeted income statement.

Variable costing is a method of preparing profit center performance reports that classifies a manager's controllable costs as either variable or fixed. Variable costing produces a variable costing income statement instead of a traditional income statement (also called a *full costing* or *absorption costing* or *traditional income statement*), which is used for external reporting purposes.

A variable costing income statement is the same as a contribution margin income statement, whose format you may recall from its use in cost-volume-profit analysis. Such an income statement is useful in performance management and evaluation because it focuses on cost variability and the profit center's contribution to operating income.

A variable costing income statement differs from the traditional income statement prepared for financial reporting, as shown by the two income statements in Exhibit 8-2 for Trenton Restaurant, which is part of the Restaurant Division. In the traditional income statement, all manufacturing costs are assigned to cost of goods sold; in the variable costing income statement, only the variable manufacturing costs are included.

- ▶ Under variable costing, direct materials costs, direct labor costs, and variable overhead costs are the only cost elements used to compute variable cost of goods sold.

EXHIBIT 8-2

Variable Costing Income Statement
Versus Traditional Income Statement
for Trenton Restaurant

Variable Costing Income Statement		Traditional Income Statement	
Sales	\$2,500	Sales	\$2,500
Variable cost of goods sold	1,575	Cost of goods sold	<u>1,745</u>
Variable selling expenses	<u>325</u>	(\$1,575 + \$170 = \$1,745)	
Contribution margin	\$ 600	Gross margin	\$ 755
Fixed manufacturing costs	170	Variable selling expenses	325
Fixed selling expenses	<u>230</u>	Fixed selling expenses	<u>230</u>
Profit center operating income	<u>\$ 200</u>	Profit center operating income	<u>\$ 200</u>

- ▶ Fixed manufacturing costs are considered costs of the current accounting period. Notice that fixed manufacturing costs are listed with fixed selling expenses after the contribution margin has been computed.

In addition to tracking financial performance measures, a manager of a profit center may want to measure and evaluate nonfinancial information—for example, the number of food orders processed and the average amount of a sales order at the Trenton Restaurant. The resulting report, based on variable costing and flexible budgeting, is shown in Exhibit 8-3.

Although performance reports vary in format depending on the type of responsibility center, they have some common themes:

- ▶ All responsibility center reports compare actual results to budgeted figures and focus on the differences.
- ▶ Often, comparisons are made to a flexible budget as well as to the master budget.
- ▶ Only the items that the manager can control are included in the performance report.
- ▶ Nonfinancial measures are also examined to achieve a more balanced view of the manager's responsibilities.

EXHIBIT 8-3 Performance Report Based on Variable Costing and Flexible Budgeting for the Trenton Restaurant

	Actual Results	Variance	Flexible Budget	Variance	Master Budget
Meals served	750	0	750	250 (U)	1,000
Sales (average meal \$2.85)	\$2,500.00	\$362.50 (F)	\$2,137.50	\$712.50 (U)	\$2,850.00
Controllable variable costs					
Variable cost of goods sold (\$1.50)	1,575.00	450.00 (U)	1,125.00	375.00 (F)	1,500.00
Variable selling expenses (\$0.40)	325.00	25.00 (U)	300.00	100.00 (F)	400.00
Contribution margin	\$ 600.00	\$112.50 (U)	\$ 712.50	\$237.50 (U)	\$ 950.00
Controllable fixed costs					
Fixed manufacturing expenses	170.00	30.00 (F)	200.00	0.00	200.00
Fixed selling expenses	230.00	20.00 (F)	250.00	0.00	250.00
Profit center operating income	<u>\$ 200.00</u>	<u>\$ 62.50 (U)</u>	<u>\$ 262.50</u>	<u>\$237.50 (U)</u>	<u>\$ 500.00</u>
Other nonfinancial performance measures					
Number of orders processed	300	50 (F)	N/A	N/A	250
Average sales order	\$8.34	\$3.06 (U)	N/A	N/A	\$11.40

STOP & APPLY >

Complete the following performance report for a profit center for the month ended December 31:

	Actual Results	Variance	Master Budget
Sales	\$?	\$ 20 (F)	\$ 120
Controllable variable costs			
Variable cost of goods sold	25	10 (U)	?
Variable selling and administrative expenses	<u>15</u>	<u>?</u>	<u>5</u>
Contribution margin	\$100	\$?	\$ 100
Controllable fixed costs	<u>?</u>	<u>10 (F)</u>	<u>60</u>
Profit center income	<u>\$ 50</u>	<u>\$ 10 (F)</u>	<u>\$?</u>
Performance measures			
Number of orders processed	50	20 (F)	?
Average daily sales	\$?	\$0.66 (F)	\$4.00
Number of units sold	100	40 (F)	?

SOLUTION

Profit Center			
For the Month Ended December 31			
	Actual Results	Variance	Master Budget
Sales	\$ 140	\$ 20 (F)	\$ 120
Controllable variable costs			
Variable cost of goods sold	25	10 (U)	15
Variable selling and administrative expenses	<u>15</u>	<u>10 (U)</u>	<u>5</u>
Contribution margin	\$ 100	\$ 0	\$ 100
Controllable fixed costs	<u>50</u>	<u>10 (F)</u>	<u>60</u>
Profit center operating income	<u>\$ 50</u>	<u>\$ 10 (F)</u>	<u>\$ 40</u>
Performance measures			
Number of orders processed	50	20 (F)	30
Average daily sales	\$4.66	\$0.66 (F)	\$4.00
Number of units sold	100	40 (F)	60

Performance Evaluation of Investment Centers

LO4 Prepare performance reports for investment centers using the traditional measures of return on investment and residual income and the newer measure of economic value added.

The evaluation of an investment center's performance requires more than a comparison of controllable revenues and costs with budgeted amounts. Because the managers of investment centers also control resources and invest in assets, other performance measures must be used to hold them accountable for revenues, costs, and the capital investments that they control. In this section, we focus on the traditional performance evaluation measures of return on investment and residual income and the relatively new performance measure of economic value added.

Return on Investment

Traditionally, the most common performance measure that takes into account both operating income and the assets invested to earn that income is **return on investment (ROI)**. Return on investment is computed as follows:

EXHIBIT 8-4

Performance Report Based on Return on Investment for the Restaurant Division

	Actual Results	Variance	Master Budget
Operating income	\$610	\$280 (U)	\$ 890
Assets invested	\$800	\$200 (F)	\$1,000
Performance measure			
ROI	76%	13% (U)	89%
ROI = Operating Income ÷ Assets Invested			
	\$890 ÷ \$1,000 = 0.89, or 89%		
	\$610 ÷ \$800 = 0.76, or 76%*		
*Rounded.			



$$\text{Return on Investment (ROI)} = \frac{\text{Operating Income}}{\text{Assets Invested}}$$

In this formula, *assets invested* is the average of the beginning and ending asset balances for the period.

Properly measuring the income and the assets specifically controlled by a manager is critical to the quality of this performance measure. Using ROI, it is possible to evaluate the manager of any investment center, whether it is an entire company or a unit within a company such as a subsidiary, division, or other business segment.

For example, assume that the Restaurant Division had actual operating income of \$610 and that the average assets invested were \$800. The master budget called for \$890 in operating income and \$1,000 in invested assets. As shown in Exhibit 8-4, the budgeted ROI for the division would be 89 percent, and the actual ROI would be 76 percent. The actual ROI was lower than the budgeted ROI because the division's actual operating income was lower than expected relative to the actual assets invested.

For investment centers, the ROI computation is really the aggregate measure of many interrelationships. The basic ROI equation, Operating Income ÷ Assets Invested, can be rewritten to show the many elements within the aggregate ROI number that a manager can influence. Two important indicators of performance are profit margin and asset turnover. **Profit margin** is the ratio of operating income to sales; it represents the percentage of each sales dollar that results in profit. **Asset turnover** is the ratio of sales to average assets invested; it indicates the productivity of assets, or the number of sales dollars generated by each dollar invested in assets.

Return on investment is equal to profit margin multiplied by asset turnover:

$$\text{ROI} = \text{Profit Margin} \times \text{Asset Turnover}$$

$$\text{ROI} = \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets Invested}} = \frac{\text{Operating Income}}{\text{Assets Invested}}$$

Profit margin and asset turnover help explain changes in return on investment for a single investment center or differences in return or investment among investment centers. Therefore, the formula $\text{ROI} = \text{Profit Margin} \times \text{Asset Turnover}$ is useful for analyzing and interpreting the elements that make up a business's overall return on investment.

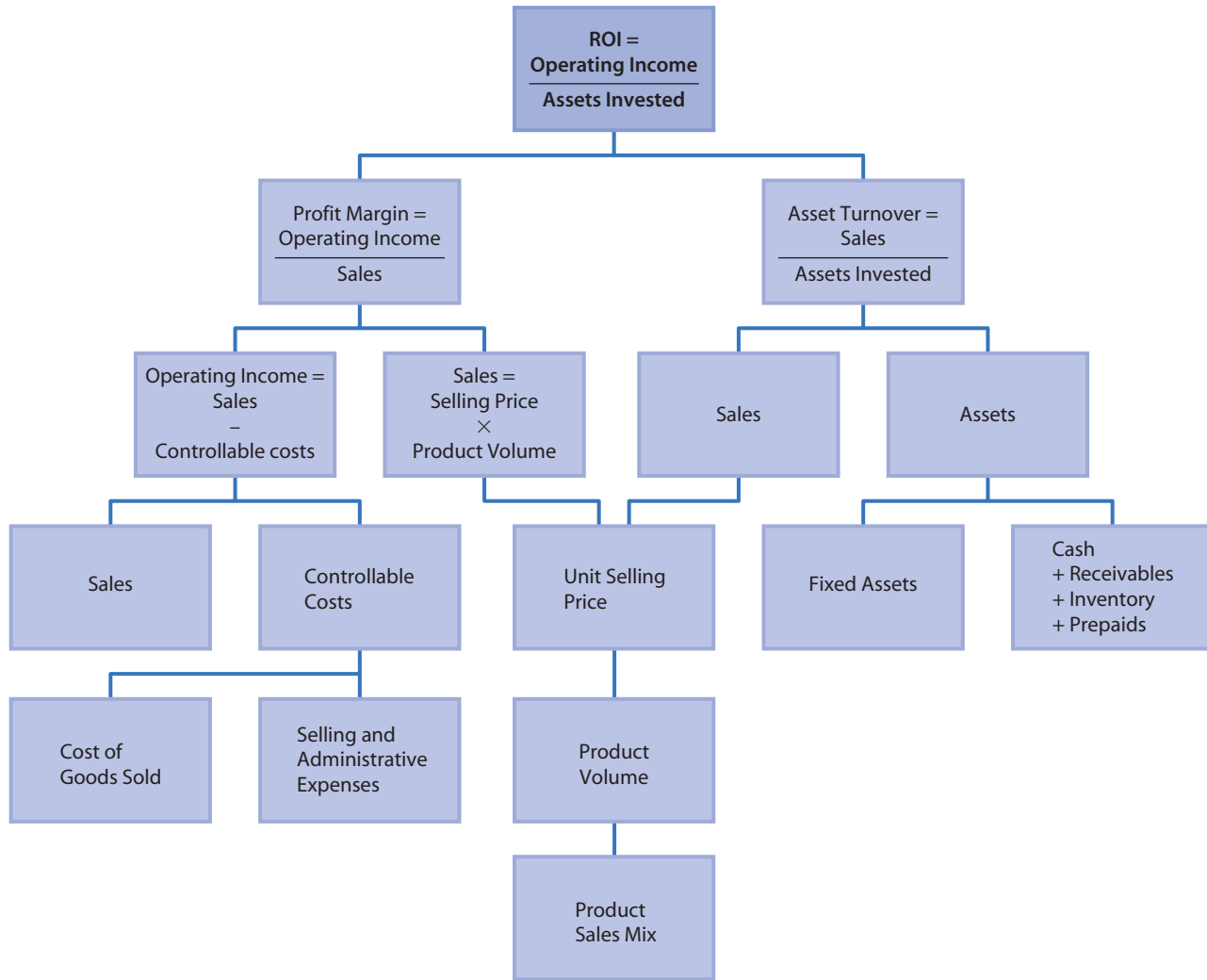
Du Pont, one of the first organizations to recognize the many interrelationships that affect ROI, designed a formula similar to the one diagrammed in Figure 8-3. You can see that ROI is affected by a manager's decisions about pricing, product

Study Note

Profit margin focuses on the income statement, and asset turnover focuses on the balance sheet aspects of ROI.



FIGURE 8-3 Factors Affecting the Computation of Return on Investment



sales mix, capital budgeting for new facilities, product sales volume, and other financial matters. In essence, a single ROI number is a composite index of many cause-and-effect relationships and interdependent financial elements. A manager can improve ROI by increasing sales, decreasing costs, or decreasing assets.

Drawbacks Because of the many factors that affect ROI, management should use this measure cautiously in evaluating performance. If ROI is overemphasized, investment center managers may react by making business decisions that favor their personal ROI performance at the expense of companywide profits or the long-term success of other investment centers. To avoid such problems, other performance measures should always be used in conjunction with ROI—for example, comparisons of revenues, costs, and operating income with budget amounts or past trends; sales growth percentages; market share percentages; or other key variables in the organization’s activity. ROI should also be compared with budgeted goals and with past ROI trends because changes in this ratio over time can be more revealing than any single number.

Residual Income

Because of the pitfalls of using return on investment as a performance measure, other approaches to evaluating investment centers have evolved. Residual income

EXHIBIT 8-5

Performance Report Based on Residual Income for the Restaurant Division

	<u>Actual Results</u>	<u>Variance</u>	<u>Master Budget</u>
Operating income	\$610	\$280 (U)	\$ 890
Assets invested	\$800	\$200 (F)	\$1,000
Desired ROI			20%
Performance measures			
ROI	76%	13% (U)	89%
Residual income	\$450	\$240 (U)	\$ 690
Residual Income = Operating Income – (Desired ROI × Assets Invested)			
	$\$890 - 20\%(\$1,000) = \$690$		
	$\$610 - 20\%(\$800) = \$450$		

Study Note

ROI is expressed as a percentage, and RI is expressed in dollars.

is one of those performance measures. **Residual income (RI)** is the operating income that an investment center earns above a minimum desired return on invested assets. Residual income is not a ratio but a dollar amount: the amount of profit left after subtracting a predetermined desired income target for an investment center. The formula for computing the residual income of an investment center is

$$\text{Residual Income} = \text{Operating Income} - (\text{Desired ROI} \times \text{Assets Invested})$$

As in the computation of ROI, assets invested is the average of the center's beginning and ending asset balances for the period.

The desired RI will vary from investment center to investment center depending on the type of business and the level of risk assumed. The performance report based on residual income for the Restaurant Division is shown in Exhibit 8-5. Assume that the residual income performance target is to exceed a 20 percent return on assets invested in the division. Note that the division's residual income is \$450, which was lower than the \$690 that was projected in the master budget.

Comparisons with other residual income figures will strengthen the analysis. To add context to the analysis of the division and its manager, questions such as the following need to be answered: How did the division's residual income this year compare with its residual income in previous years? Did the actual residual income exceed the budgeted residual income? How did this division's residual income compare with the amounts generated by other investment centers of the company?

Drawbacks Caution is called for when using residual income to compare investment centers within a company. For their residual income figures to be comparable, all investment centers must have equal access to resources and similar asset investment bases. Some managers may be able to produce larger residual incomes simply because their investment centers are larger rather than because their performance is better. Like ROI, RI has some flaws.

Economic Value Added

More and more businesses are using the shareholder wealth created by an investment center, or the **economic value added (EVA)**, as an indicator of performance. The calculation of EVA, a registered trademark of the consulting

EXHIBIT 8-6

Performance Report Based on Economic Value Added for the Restaurant Division

	<u>Actual Results</u>	<u>Variance</u>	<u>Master Budget</u>
Performance measures			
ROI	76%	13% (U)	89%
Residual income	\$450	\$240 (U)	\$690
Economic value added	\$334		
Economic Value Added = After-Tax Operating Income – [Cost of Capital × (Total Assets – Current Liabilities)]			
	$\$400 - 12\%(\$800 - \$250) = \334		

firm **Stern Stewart & Company**, can be quite complex because it makes various cost of capital and accounting principles adjustments. You will learn more about the cost of capital in the chapter that discusses capital investment decisions. However, for the purposes of computing EVA, the **cost of capital** is the minimum desired rate of return on an investment, such as the assets invested in an investment center.

Basically, the computation of EVA is similar to the computation of residual income, except that after-tax operating income is used instead of pretax operating income, and a cost of capital percentage is multiplied by the center's invested assets less current liabilities instead of a desired ROI percentage being multiplied by invested assets. Also, like residual income, the economic value added is expressed in dollars. The formula is

$$\text{EVA} = \text{After-Tax Operating Income} - [\text{Cost of Capital} \times (\text{Total Assets} - \text{Current Liabilities})]$$

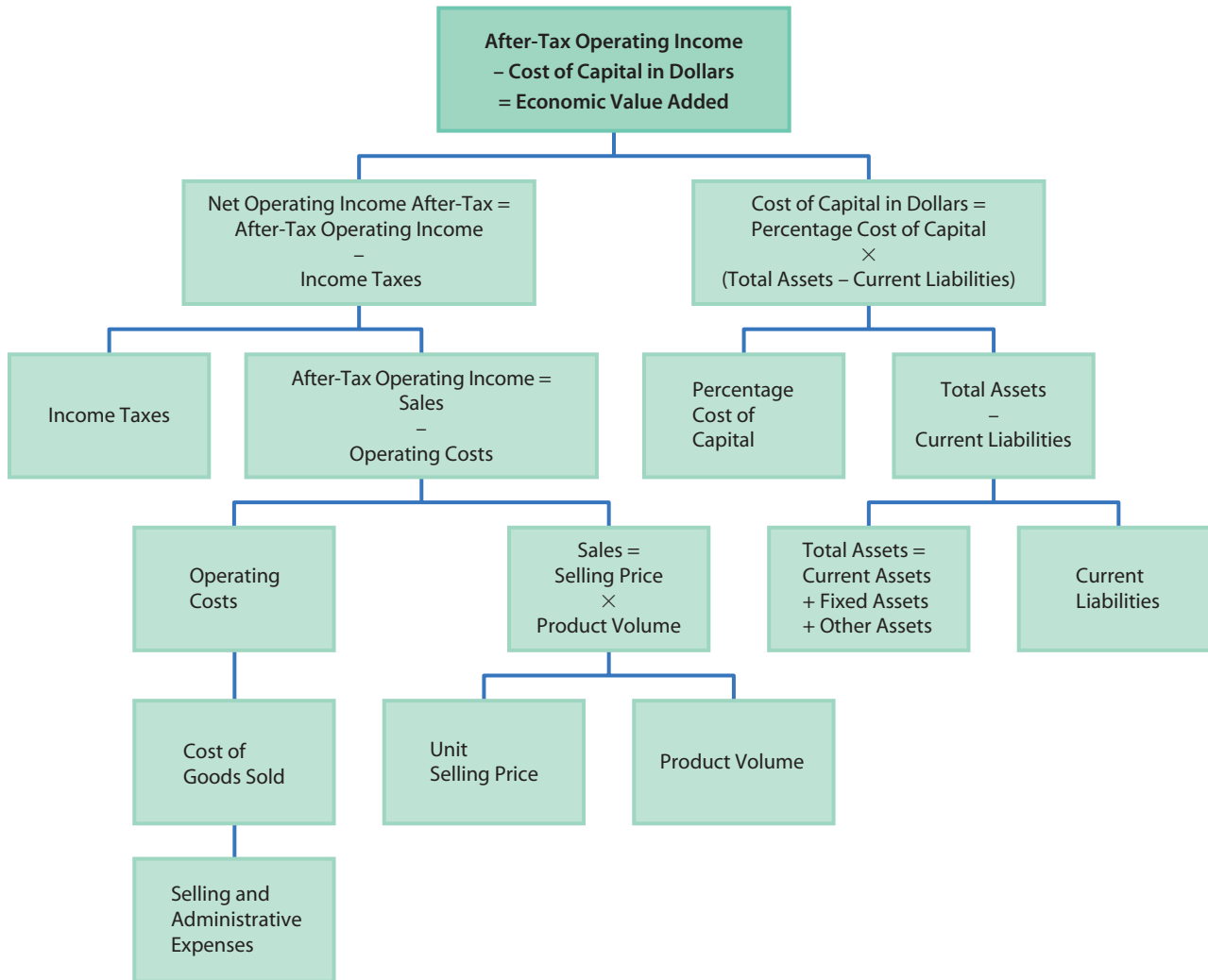
A very basic computation of economic value added for the Restaurant Division is shown in Exhibit 8-6. The report assumes that the division's after-tax operating income is \$400, its cost of capital is 12 percent, its total assets are \$800, and its current liabilities are \$250.

- ▶ The report shows that the division has added \$334 to its economic value after taxes and cost of capital. In other words, the division produced after-tax profits of \$334 in excess of the cost of capital required to generate those profits.

The factors that affect the computation of economic value added are illustrated in Figure 8-4. An investment center's economic value is affected by managers' decisions on pricing, product sales volume, taxes, cost of capital, capital investments, and other financial matters.

- ▶ In essence, the EVA number is a composite index drawn from many cause-and-effect relationships and interdependent financial elements.
- ▶ A manager can improve the economic value of an investment center by increasing sales, decreasing costs, decreasing assets, or lowering the cost of capital.

Drawbacks Because many factors affect the economic value of an investment center and its cost of capital, management should be cautious when drawing conclusions about performance. The evaluation will be more meaningful if the current economic value added is compared to EVAs from previous periods, target EVAs, and EVAs from other investment centers.

FIGURE 8-4 Factors Affecting the Computation of Economic Value Added

The Importance of Multiple Performance Measures

In summary, to be effective, a performance management system must consider both operating results and multiple performance measures, such as return on investment, residual income, and economic value added. Comparing actual results to budgeted figures adds meaning to the evaluation. Performance measures such as ROI, RI, and EVA indicate whether an investment center is effective in coordinating its own goals with companywide goals because these measures take into account both operating income and the assets used to produce that income. However, all three measures are limited by their focus on short-term financial performance.

- ▶ To obtain a fuller picture, management needs to break these three measures down into their components, analyze such information as responsibility center income over time, and compare current results to the targeted amounts in the flexible or master budget.
- ▶ In addition, the analysis of such nonfinancial performance indicators as average throughput time, employee turnover, and number of orders processed will ensure a more balanced view of a business's well-being and how to improve it.

STOP & APPLY >

Brew Mountain Company sells coffee and hot beverages. Its Coffee Cart Division sells to skiers as they come off the mountain. The balance sheet for the Coffee Cart Division showed that the company had invested assets of \$30,000 at the beginning of the year and \$50,000 at the end of the year. During the year, the division's operating income was \$80,000 on sales of \$120,000.

- Compute the division's residual income if the desired ROI is 20 percent.
- Compute the return on investment for the division.
- Compute the economic value added for Brew Mountain Company if total corporate assets are \$600,000, current liabilities are \$80,000, after-tax operating income is \$70,000, and the cost of capital is 12 percent.

SOLUTION

- $\$80,000 - \{20\% \times [(\$30,000 + \$50,000) \div 2]\} = \$72,000$
- $\$80,000 \div [(\$30,000 + \$50,000) \div 2] = 200\%$
- $\$70,000 - [12\% \times (\$600,000 - \$80,000)] = \$7,600$

Performance Incentives and Goals

L05 Explain how properly linked performance incentives and measures add value for all stakeholders in performance management and evaluation.

The effectiveness of a performance management and evaluation system depends on how well it coordinates the goals of responsibility centers, managers, and the entire company. Two factors are key to the successful coordination of goals:

- ▶ The logical linking of goals to measurable objectives and targets
- ▶ The tying of appropriate compensation incentives to the achievement of the targets—that is, performance-based pay

Linking Goals, Performance Objectives, Measures, and Performance Targets

The causal links among an organization's goals, performance objectives, measures, and targets must be apparent. For example, if a company seeks to be an environmental steward, as **Vail Resorts** does, it may choose the following linked goal, objective, measure, and performance target:

<i>Goal</i>	<i>Objective</i>	<i>Measure</i>	<i>Performance Target</i>
To be an environmental steward	To reduce, reuse, and recycle	Number of tons recycled per year	To recycle at least one pound per guest

You may recall that the balanced scorecard also links objectives, measures, and targets, as shown earlier in Figure 8-1.



FOCUS ON BUSINESS PRACTICE

Pay-for-Performance Reality Check

Many service businesses, such as the CPA firm **Meyners + Company**, assume that aligning staff performance and compensation with the business's core values and competencies is a simple matter. But for Meyners, it turned out that administering a pay-for-performance program

was time-consuming and data-intensive. Based on a survey of the entire firm four years after the program was inaugurated, the pay-for-performance structure was simplified, and employees were offered other types of incentives.³

Performance-Based Pay

The tying of appropriate compensation incentives to performance targets increases the likelihood that the goals of responsibility centers, managers, and the entire organization will be well coordinated. Unfortunately, this linkage does not always happen. Responsibility center managers are more likely to achieve their performance targets if their compensation depends on it. **Performance-based pay** is the linking of employee compensation to the achievement of measurable business targets.

Cash bonuses, awards, profit-sharing plans, and stock options are common types of incentive compensation.

- ▶ Cash bonuses are usually given to reward an individual's short-term performance. A bonus may be stated as a fixed dollar amount or as a percentage of a target figure, such as 5 percent of operating income or 10 percent of the dollar increase in operating income.
- ▶ An award may be a trip or some other form of recognition for desirable individual or group performance. For example, many companies sponsor a trip for all managers who have met their performance targets during a specified period. Other companies award incentive points that employees may redeem for goods or services. (Notice that awards can be used to encourage both short-term and long-term performance.)
- ▶ Profit-sharing plans reward employees with a share of the company's profits.
- ▶ Employees often receive company stock as recognition of their contribution to a profitable period. Using stock as a reward encourages employees to think and act as both investors and employees and encourages a stable work force. In terms of the balanced scorecard, employees assume two stakeholder perspectives and take both a short- and a long-term viewpoint. Companies use stock to motivate employees to achieve financial targets that increase the company's stock price.

The Coordination of Goals

What performance incentives and measures should a company use to manage and evaluate performance? What actions and behaviors should an organization reward? Which incentive compensation plans work best? The answers to such questions depend on the facts and circumstances of each organization. To determine



FOCUS ON BUSINESS PRACTICE

Aligning Incentives Among Supply-Chain Partners

A study of more than 50 supply networks found that misaligned performance incentives are often the cause of inventory buildups or shortages, misguided sales efforts, and poor customer relations. A supply chain works only if the partners work together effectively by adopting

revenue-sharing contracts, using technology to track shared information, and/or working with intermediaries to build trust. Such incentives among supply-chain partners must be reassessed periodically as business conditions change.⁴

the right performance incentives for their organization, employees and managers must answer several questions:

- ▶ When should the reward be given—now or sometime in the future?
- ▶ Whose performance should be rewarded—that of responsibility centers, individual managers, or the entire company?
- ▶ How should the reward be computed?
- ▶ On what should the reward be based?
- ▶ What performance criteria should be used?
- ▶ Does our performance incentive plan address the interests of all stakeholders?

The effectiveness of a performance management and evaluation system relies on the coordination of responsibility center, managerial, and company goals. Performance can be optimized by linking goals to measurable objectives and targets and by tying appropriate compensation incentives to the achievement of the targets. Each organization's unique circumstances will determine the correct mix of measures and compensation incentives for that organization. If management values the perspectives of all of its stakeholder groups, its performance management and evaluation system will balance and benefit all interests.

STOP

& APPLY >

Necessary Toys, Inc., has adopted the balanced scorecard to motivate its managers to work toward the companywide goal of leading its industry in innovation. Identify the four stakeholder perspectives that would link to the following objectives, measures, and targets:

<u>Perspective</u>	<u>Objective</u>	<u>Measure</u>	<u>Target</u>
	Profitable new products	New-product ROI	New-product ROI of at least 75 percent
	Work force with cutting-edge skills	Percentage of employees cross-trained on work-group tasks	100 percent of work group cross-trained on new tasks within 30 days
	Agile product design and production processes	Time to market (the time between a product idea and its first sales)	Time to market less than one year for 80 percent of product introductions
	Successful product introductions	New-product market share	Capture 80 percent of new-product market within one year

SOLUTION

Goal: Company leads its industry in innovation

<u>Perspective</u>	<u>Objective</u>	<u>Measure</u>	<u>Target</u>
Financial (investors)	Profitable new products	New-product ROI	New-product ROI of at least 75 percent
Learning and growth (employees)	Work force with cutting-edge skills	Percentage of employees cross-trained on work-group tasks	100 percent of work group cross-trained on new tasks within 30 days
Internal business processes	Agile product design and production processes	Time to market (the time between a product idea and its first sales)	Time to market less than one year for 80 percent of product introductions
Customers	Successful product introductions	New-product market share	Capture 80 percent of new-product market within one year

A LOOK BACK AT ► VAIL RESORTS

In this chapter's Decision Point, we asked these questions:

- How do managers at **Vail Resorts** link performance measures and set performance targets to achieve performance objectives?
- How do they use the PEAKS system and its integrated database to improve performance management and evaluation?

Managers at Vail Resorts link their organization's vision and strategy to their performance objectives; they then link the objectives to logical performance measures; and, finally, they set performance targets. A balanced scorecard approach enables them to consider the perspectives of all the organization's stakeholders: financial (investors), learning and growth (employees), internal business processes, and customers.

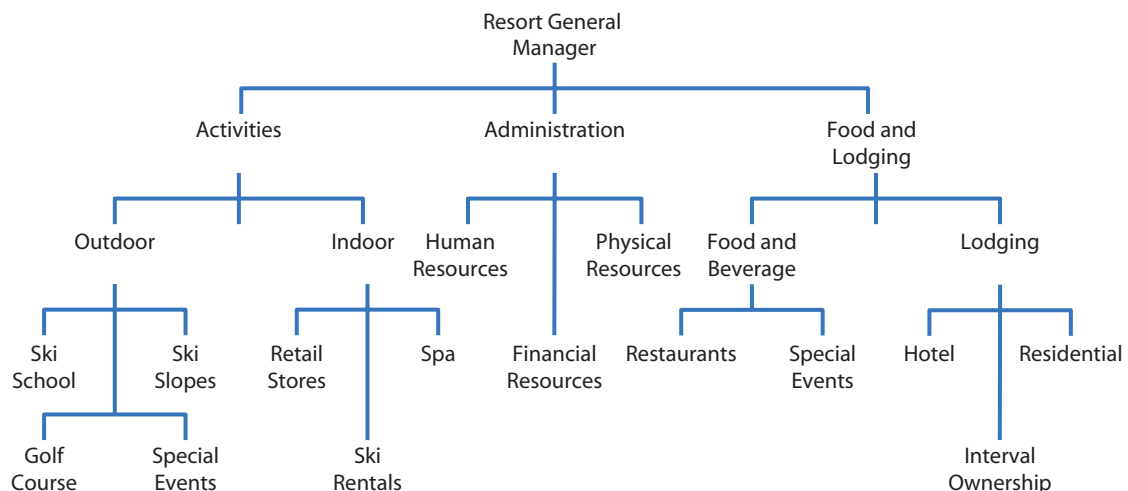
As we indicated in the Decision Point, Vail Resorts' managers like the PEAKS all-in-one-card system because it is a quick and easy way of collecting huge amounts of valuable and versatile information. Whenever a guest's card is scanned, new data enter the system and become part of an integrated management information system that allows managers to measure and control costs, quality, and performance in all of the resort's areas. The system's ability to store both financial and nonfinancial data about all aspects of the resort enables managers to learn about and balance the interests of all the organization's stakeholders. The managers can then use the information to answer traditional financial questions about such matters as the cost of sales and the value of inventory (e.g., food ingredients in the resort's restaurants and the merchandise in its shops) and to obtain performance data about the resort's activities, products, services, and customers. In addition, the system provides managers with timely feedback about their performance, which encourages continuous improvement.



Review Problem

Evaluating Profit Center and Investment Center Performance
LO3 LO4 LO5

Assume that a company like **Vail Resorts** has just acquired Winter Wonderland, a full-service resort and spa. When Vail investigated Winter Wonderland, it learned the following: Mary Fortenberry, the resort's general manager, is responsible for guest activities, administration, and food and lodging. In addition, she is solely responsible for the resort's capital investments. The organization chart below shows the resort's various activities and the levels of authority that Fortenberry has established:



Three divisional managers receive compensation based on their division's performance and have the authority to make employee compensation decisions for their division. Alexandra Patel manages the Food and Lodging Division. The Food and Lodging Division's master budget and actual results for the year ended June 30 follow.

	A	B	C	D	E
1	Winter Wonderland Resort				
2	Food and Lodging Division				
3	For the Year Ended June 30				
4	(Dollar amounts in thousands)				
5				Master	Actual
6				Budget	Results
7	Guest days			4,000	4,100
8	Sales			\$38,000	\$40,000
9	Variable cost of sales			24,000	25,000
10	Variable selling and administrative expenses			4,000	4,250
11	Fixed cost of sales			2,000	1,800
12	Fixed selling and administrative expenses			2,500	2,500
13					

Required

1. What types of responsibility centers are Administration, Food and Lodging, and Resort General Manager?
2. Assume that Food and Lodging is a profit center. Prepare a performance report using variable costing and flexible budgeting. Determine the variances between actual results and the corresponding figures in the flexible budget and the master budget.
3. Assume that the divisional managers have been assigned responsibility for capital expenditures and that their divisions are thus investment centers. Food and Lodging is expected to generate a desired ROI of at least 30 percent on average assets invested of \$10,000,000.
 - a. Compute the division's return on investment and residual income using the average assets invested in both the actual and budget calculations.
 - b. Using the ROI and residual income, evaluate Alexandra Patel's performance as divisional manager.
4. Compute the division's actual economic value added if the division's assets are \$12,000,000, current liabilities are \$3,000,000, after-tax operating income is \$4,500,000, and the cost of capital is 20 percent.

Answers to Review Problem

- Administration: discretionary cost center; Food and Lodging: profit center; Resort General Manager: investment center
- Performance report:

	A	B	C	D	E	F	G	H	I	J
1	Winter Wonderland Resort									
2	Food and Lodging Division									
3	For the Year Ended June 30									
4	(Dollar amounts in thousands)									
5				Actual			Flexible			Master
6				Results	Variance		Budget	Variance		Budget
7	Guest days			4,100	—		4,100	100	(F)	4,000
8	Sales			\$40,000	\$1,050	(F)	\$38,950	\$950	(F)	\$38,000
9	Controllable variable costs									
10		Variable cost of sales		25,000	400	(U)	24,600	600	(U)	24,000
11		Variable selling and								
12		administrative								
13		expenses		4,250	150	(U)	4,100	100	(U)	4,000
14	Contribution margin			\$10,750	\$ 500	(F)	\$10,250	\$250	(F)	\$10,000
15	Controllable fixed costs									
16		Fixed cost of sales		1,800	200	(F)	2,000	—		2,000
17		Fixed selling and								
18		administrative								
19		expenses		2,500	—		2,500	—		2,500
20	Division operating income			\$ 6,450	\$ 700	(F)	\$ 5,750	\$250	(F)	\$ 5,500
21										

- a. *Return on investment*

Actual results: $\$6,450,000 \div \$10,000,000 = 64.50\%$

Flexible budget: $\$5,750,000 \div \$10,000,000 = 57.50\%$

Master budget: $\$5,500,000 \div \$10,000,000 = 55.00\%$

Residual income

Actual results: $\$6,450,000 - 30\%(\$10,000,000) = \$3,450,000$

Flexible budget: $\$5,750,000 - 30\%(\$10,000,000) = \$2,750,000$

Master budget: $\$5,500,000 - 30\%(\$10,000,000) = \$2,500,000$

- b. Alexandra Patel's performance as the divisional manager of Food and Lodging exceeds company performance expectations. Actual ROI was 64.5 percent, whereas the company expected an ROI of 30 percent and the flexible budget and the master budget showed projections of 57.5 percent and 55.0 percent, respectively. Residual income also exceeded expectations. The Food and Lodging Division generated \$3,450,000 in residual income when the flexible budget and master budget had projected RIs of \$2,750,000 and \$2,500,000, respectively. The performance report for the division shows 100 more guest days than had been anticipated and a favorable controllable fixed cost variance. As a manager, Patel will investigate the unfavorable variances associated with her controllable variable costs.

4. Economic value added:

$$\$4,500,000 - 20\%(\$12,000,000 - \$3,000,000) = \$2,700,000$$


STOP & REVIEW >
LO1 Define a performance management and evaluation system, and describe how the balanced scorecard aligns performance with organizational goals.

An effective performance management and evaluation system accounts for and reports on both financial and nonfinancial performance so that a company can ascertain how well it is doing, where it is going, and what improvements will make it more profitable. Each company must develop a set of performance measures appropriate to its specific needs. Besides answering basic questions about what to measure and how to measure, managers must consider a variety of other issues. They must collaborate to develop a group of measures, such as the balanced scorecard, that will help them determine how to improve performance.

The balanced scorecard is a framework that links the perspectives of an organization's four basic stakeholder groups—financial, learning and growth, internal business processes, and customers—with its mission and vision, performance measures, strategic and tactical plans, and resources. Ideally, managers should see how their actions help to achieve organizational goals and understand how their compensation is linked to their actions. The balanced scorecard assumes that an organization will get what it measures.

LO2 Define responsibility accounting, and describe the role that responsibility centers play in performance management and evaluation.

Responsibility accounting classifies data according to areas of responsibility and reports each area's activities by including only the revenue, cost, and resource categories that the assigned manager can control. There are five types of responsibility centers: cost, discretionary cost, revenue, profit, and investment. Performance reporting by responsibility center allows the source of a cost, revenue, or resource to be traced to the manager who controls it and thus makes it easier to evaluate a manager's performance.

LO3 Prepare performance reports for cost centers using flexible budgets and for profit centers using variable costing.

Performance reports contain information about the costs, revenues, and resources that individual managers can control. The content and format of a performance report depend on the nature of the responsibility center.

The performance of a cost center can be evaluated by comparing its actual costs with the corresponding amounts in the flexible and master budgets. A flexible budget is a summary of anticipated costs for a range of activity levels. It provides forecasted cost data that can be adjusted for changes in the level of output. A flexible budget is derived by multiplying actual unit output by predetermined standard unit costs for each cost item in the report.

The performance of a profit center is usually evaluated by comparing the profit center's actual income statement results with its budgeted income statement. When variable costing is used, the controllable costs of the profit center's manager are classified as variable or fixed. The resulting performance report takes the form of a contribution margin income statement. The variable costing income statement is useful because it focuses on cost variability and the profit center's contribution to operating income.

LO4 Prepare performance reports for investment centers using the traditional measures of return on investment and residual income and the newer measure of economic value added.

Traditionally, the most common performance measure has been return on investment (ROI). The basic formula is $ROI = \text{Operating Income} \div \text{Assets Invested}$. Return on investment can also be examined in terms of profit margin and asset turnover. In this case, $ROI = \text{Profit Margin} \times \text{Asset Turnover}$, where $\text{Profit Margin} = \text{Operating Income} \div \text{Sales}$, and $\text{Asset Turnover} = \text{Sales} \div \text{Assets Invested}$. Residual income (RI) is the operating income that an investment center earns above a minimum desired return on invested assets. It is expressed as a dollar amount: $\text{Residual Income} = \text{Operating Income} - (\text{Desired ROI} \times \text{Assets}$

Invested). It is the amount of profit left after subtracting a predetermined desired income target for an investment. Today, businesses are increasingly using the shareholder wealth created by an investment center, or economic value added (EVA), as a performance measure. The calculation of economic value added can be quite complex because of the various adjustments it involves. Basically, it is similar to the calculation of residual income: $EVA = \text{After-Tax Operating Income} - \text{Cost of Capital in Dollars}$. A manager can improve the economic value of an investment center by increasing sales, decreasing costs, decreasing assets, or lowering the cost of capital.

LO5 Explain how properly linked performance incentives and measures add value for all stakeholders in performance management and evaluation.

The effectiveness of a performance management and evaluation system depends on how well it coordinates the goals of responsibility centers, managers, and the entire company. Performance can be optimized by linking goals to measurable objectives and targets and tying appropriate compensation incentives to the achievement of those targets. Common types of incentive compensation are cash bonuses, awards, profit-sharing plans, and stock options. If management values the perspectives of all of its stakeholder groups, its performance management and evaluation system will balance and benefit all interests.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Balanced scorecard 303 (LO1)

Controllable costs and revenues 306 (LO2)

Cost center 306 (LO2)

Cost of capital 317 (LO4)

Discretionary cost center 307 (LO2)

Flexible budget 310 (LO3)

Investment center 308 (LO2)

Organization chart 308 (LO2)

Performance-based pay 320 (LO5)

Performance management and evaluation system 302 (LO1)

Performance measurement 302 (LO1)

Profit center 308 (LO2)

Responsibility accounting 305 (LO2)

Responsibility center 306 (LO2)

Revenue center 308 (LO2)

Variable costing 311 (LO3)

Key Ratios

Asset turnover 314 (LO4)

Economic value added (EVA) 316 (LO4)

Profit margin 314 (LO4)

Residual income (RI) 316 (LO4)

Return on investment (ROI) 313 (LO4)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

LO1 Balanced Scorecard

SE 1. One of your college's overall goals is customer satisfaction. In light of that goal, match each of the following stakeholders' perspectives with the appropriate objective:

Perspective	Objective
1. Financial (investors)	a. Customer satisfaction means that the faculty (employees) engages in cutting-edge research.
2. Learning and growth	b. Customer satisfaction means that students receive their degrees in four years.
3. Internal business processes	c. Customer satisfaction means that the college has a winning athletics program.
4. Customers	d. Customer satisfaction means that fund-raising campaigns are successful.

LO2 Responsibility Centers

SE 2. Identify each of the following as a cost center, a discretionary cost center, a revenue center, a profit center, or an investment center:

1. The manager of center A is responsible for generating cash inflows and incurring costs with the goal of making money for the company. The manager has no responsibility for assets.
2. Center B produces a product that is not sold to an external party but transferred to another center for further processing.
3. The manager of center C is responsible for the telephone order operations of a large retailer.
4. Center D designs, produces, and sells products to external parties. The manager makes both long-term and short-term decisions.
5. Center E provides human resource support for the other centers in the company.

LO2 Controllable Costs

SE 3. Ha Kim is the manager of the Paper Cutting Department in the Northwest Division of Striking Paper Products. Identify each of the following costs as either controllable or not controllable by Kim:

1. Lumber Department hauling costs
2. Salaries of cutting machine workers
3. Cost of cutting machine parts
4. Cost of electricity for the Northwest Division
5. Vice president's salary

LO3 Cost Center Performance Report

SE 4. Complete the following performance report for cost center C for the month ended December 31:

	Actual Results	Variance	Flexible Budget	Variance	Master Budget
Units produced	<u>80</u>	<u>0</u>	<u>?</u>	<u>(20) U</u>	<u>100</u>
Center costs					
Direct materials	\$ 84	\$?	\$ 80	\$?	\$100
Direct labor	150	?	?	40 (F)	200
Variable overhead	?	20(U)	240	?	300
Fixed overhead	<u>270</u>	<u>?</u>	<u>250</u>	<u>?</u>	<u>250</u>
Total cost	<u>\$?</u>	<u>\$34(U)</u>	<u>\$?</u>	<u>\$120 (F)</u>	<u>\$850</u>
Performance measures					
Defect-free units to total produced	80%	?	N/A	N/A	90%
Average throughput time per unit	11 minutes	?	N/A	N/A	10 minutes

LO3 Profit Center Performance Report

SE 5. Complete this performance report for profit center P for the month ended December 31:

	Actual Results	Variance	Master Budget
Sales	\$?	\$ 20 (F)	\$ 120
Controllable variable costs			
Variable cost of goods sold	25	10 (U)	?
Variable selling and administrative expenses	<u>15</u>	<u>?</u>	<u>5</u>
Contribution margin	\$100	\$?	\$ 100
Controllable fixed costs	<u>?</u>	<u>20 (F)</u>	<u>60</u>
Profit center operating income	<u>\$ 60</u>	<u>\$ 20 (F)</u>	<u>\$?</u>
Performance measures			
Number of orders processed	50	20 (F)	?
Average daily sales	\$?	\$0.68 (F)	\$4.00
Number of units sold	100	40 (F)	?

LO4 Return on Investment

SE 6. Complete the profit margin, asset turnover, and return on investment calculations for investment centers D and V

	Subsidiary D	Subsidiary V
Sales	\$1,650	\$2,840
Operating income	\$180	\$210
Average assets invested	\$940	\$1,250
Profit margin	?	7.39%
Asset turnover	1.76 times	?
ROI	?	?

LO4 Return on Investment

SE 7. Complete the average assets invested, profit margin, asset turnover, and return on investment calculations for investment centers J and K on the next page.

	Subsidiary J	Subsidiary K
Sales	\$2,000	\$2,000
Operating income	\$500	\$800
Beginning assets invested	\$4,000	\$500
Ending assets invested	\$6,000	\$1,500
Average assets invested	\$?	\$?
Profit margin	25%	?
Asset turnover	?	2 times
ROI	?	?

L04 Residual Income

SE 8. Complete the operating income, ending assets invested, average assets invested, and residual income calculations for investment centers H and F:

	Subsidiary H	Subsidiary F
Sales	\$20,000	\$25,000
Operating income	\$1,500	\$?
Beginning assets invested	\$4,000	\$500
Ending assets invested	\$6,000	\$?
Average assets invested	\$?	\$1,000
Desired ROI	20%	20%
Residual income	\$?	\$600

L04 Economic Value Added

SE 9. Complete the current liabilities, total assets—current liabilities, and economic value added calculations for investment centers M and N:

	Subsidiary M	Subsidiary N
Sales	\$15,000	\$18,000
After-tax operating income	\$1,000	\$1,100
Total assets	\$4,000	\$5,000
Current liabilities	\$1,000	\$?
Total assets – current liabilities	\$?	\$3,500
Cost of capital	15%	15%
Economic value added	\$?	\$?

L05 Coordination of Goals

SE 10. One of your college's goals is customer satisfaction. In view of that goal, identify each of the following as a linked objective, a measure, or a performance target:

1. To have successful fund-raising campaigns
2. Number of publications per year per tenure-track faculty
3. To increase the average donation by 10 percent
4. Average number of dollars raised per donor
5. To have faculty engage in cutting-edge research
6. To increase the number of publications per faculty member by at least one per year

Exercises**L01 Balanced Scorecard**

E 1. Biggs Industries is considering adopting the balanced scorecard and has compiled the following list of possible performance measures. Select the balanced scorecard perspective that best matches each performance measure.

Performance Measure

1. Residual income
2. Customer satisfaction rating
3. Employee absentee rate
4. Growth in profits
5. On-time deliveries
6. Manufacturing processing time

Balanced Scorecard Perspective

- a. Financial (investors)
- b. Learning and growth (employees)
- c. Internal business processes
- d. Customers

L01 Balanced Scorecard

E 2. Valient Online Products is considering adopting the balanced scorecard and has compiled the following list of possible performance measures. Select the balanced scorecard perspective that best matches each performance measure.

Performance Measure

1. Economic value added
2. Employee turnover
3. Average daily sales
4. Defect-free units
5. Number of repeat customer visits
6. Employee training hours

Balanced Scorecard Perspective

- a. Financial (investors)
- b. Learning and growth (employees)
- c. Internal business processes
- d. Customers

L01 Performance Measures

E 3. Beva Washington wants to measure her division's product quality. Link an appropriate performance measure with each balanced scorecard perspective.

Product Quality

1. Financial (investors)
2. Learning and growth (employees)
3. Internal business processes
4. Customers

Possible Performance Measures

- a. Number of defective products returned
- b. Number of products failing inspection
- c. Increased market share
- d. Savings from employee suggestions

L01 Performance Measures

E 4. Sam Yu wants to measure customer satisfaction within his region. Link an appropriate performance measure with each balanced scorecard perspective.

Customer Satisfaction

1. Financial (investors)
2. Learning and growth (employees)
3. Internal business processes
4. Customers

Possible Performance Measures

- a. Number of staff promotions
- b. Number of repeat customers
- c. Number of process improvements
- d. Percentage sales increase over last period

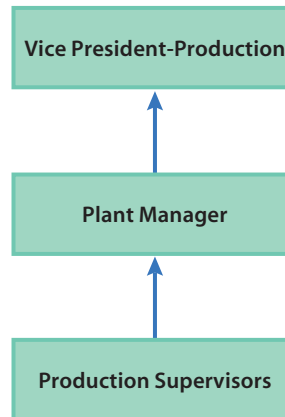
L02 Responsibility Centers

E 5. Identify the most appropriate type of responsibility center for each of the following organizational units:

1. A manufacturing department of a large corporation
2. An eye clinic in a community hospital
3. The South American division of a multinational company
4. The food preparation plant of a large restaurant chain
5. The catalog order department of a retailer

L02 Controllable Costs

E 6. Angel Sweets produces pies. The company has the following three-tiered manufacturing structure:



Identify the manager responsible for each of the following costs:

- | | |
|---------------------------------|------------------------------|
| 1. Repair and maintenance costs | 7. Plant manager's salary |
| 2. Materials handling costs | 8. Cost of materials used |
| 3. Direct labor | 9. Storage of finished goods |
| 4. Supervisors' salaries | 10. Property taxes—plant |
| 5. Maintenance of plant grounds | 11. Depreciation—plant |
| 6. Depreciation—equipment | |

L02 Organization Chart

E 7. Happy Industries wants to formalize its management structure by designing an organization chart. The company has a president, a board of directors, and two vice presidents. Four discretionary cost centers—Financial Resources, Human Resources, Information Resources, and Physical Resources—report to one of the vice presidents. The other vice president has one manufacturing plant with three subassembly areas reporting to her. Draw the company's organization chart.

L03 Performance Reports

E 8. Jackie Jefferson, a new employee at Handown, Inc., is learning about the various types of performance reports. Describe the typical contents of a performance report for each type of responsibility center.

L03 Variable Costing Income Statement

E 9. Vegan, LLC, owns a chain of gourmet vegetarian take-out markets. Last month, Store Q generated the following information: sales, \$890,000; direct materials, \$220,000; direct labor, \$97,000; variable overhead, \$150,000; fixed overhead, \$130,000; variable selling and administrative expenses, \$44,500; and fixed selling expenses, \$82,300. There were no beginning or ending inventories. Average daily sales (25 business days) were \$35,600. Customer orders processed totaled 15,000.

Vegan had budgeted monthly sales of \$900,000; direct materials, \$210,000; direct labor, \$100,000; variable overhead, \$140,000; fixed overhead, \$140,000; variable selling and administrative expenses, \$45,000; and fixed selling expenses, \$60,000. Store Q had been projected to do \$36,000 in daily sales and process 16,000 customer orders. Using this information, prepare a performance report for Store Q.

L03 Variable Costing Income Statement

E 10. The income statement in the traditional reporting format for Green Products, Inc., for the year ended December 31, is as follows:

Green Products, Inc.	
Income Statement	
For the Year Ended December 31	
Sales	\$296,400
Cost of goods sold	<u>112,750</u>
Gross margin	\$183,650
Selling expenses	
Variable	69,820
Fixed	36,980
Administrative expenses	<u>27,410</u>
Operating income	<u>\$ 49,440</u>

Total fixed manufacturing costs for the year were \$16,750. All administrative expenses are considered to be fixed.

Using this information, prepare an income statement for Green Products, Inc., for the year ended December 31, using the variable costing format.

L03 Performance Report for a Cost Center

E 11. Archer, LLC, owns a blueberry processing plant. Last month, the plant generated the following information: blueberries processed, 50,000 pounds; direct materials, \$50,000; direct labor, \$10,000; variable overhead, \$12,000; and fixed overhead, \$13,000. There were no beginning or ending inventories. Average daily pounds processed (25 business days) were 2,000. Average rate of processing was 250 pounds per hour.

At the beginning of the month, Archer had budgeted costs of blueberries, \$45,000; direct labor, \$10,000; variable overhead, \$14,000; and fixed overhead, \$14,000. The monthly master budget was based on producing 50,000 pounds of blueberries each month. This means that the plant had been projected to process 2,000 pounds daily at the rate of 240 pounds per hour.

Using this information, prepare a performance report for the month for the blueberry processing plant. Include a flexible budget and a computation of variances in your report. Indicate whether the variances are favorable (F) or unfavorable (U) to the performance of the plant.

L04 Investment Center Performance

E 12. Momence Associates is evaluating the performance of three divisions: Maple, Oaks, and Juniper. Using the following data, compute the return on investment and residual income for each division, compare the divisions' performance, and comment on the factors that influenced performance:

	Maple	Oaks	Juniper
Sales	\$100,000	\$100,000	\$100,000
Operating income	\$10,000	\$10,000	\$20,000
Assets invested	\$25,000	\$12,500	\$25,000
Desired ROI	40%	40%	40%

L04 Economic Value Added

E 13. Leesburg, LLP, is evaluating the performance of three divisions: Lake, Sumter, and Poe. Using the data that appear on the next page, compute the economic value added by each division, and comment on each division's performance.

	Lake	Sumter	Poe
Sales	\$100,000	\$100,000	\$100,000
After-tax operating income	\$10,000	\$10,000	\$20,000
Total assets	\$25,000	\$12,500	\$25,000
Current liabilities	\$5,000	\$5,000	\$5,000
Cost of capital	15%	15%	15%

L05 Performance Incentives

E 14. Dynamic Consulting is advising Solid Industries on the short-term and long-term effectiveness of cash bonuses, awards, profit sharing, and stock as performance incentives. Prepare a chart identifying the effectiveness of each incentive as either long-term or short-term or both.

L05 Goal Congruence

E 15. Serious Toys, Inc., has adopted the balanced scorecard to motivate its managers to work toward the companywide goal of leading its industry in innovation. Identify the four stakeholder perspectives that would link to the following objectives, measures, and targets:

Perspective	Objective	Measure	Target
	Profitable new products	New product RI	New-product RI of at least \$100,000
	Work force with cutting-edge skills	Percentage of employees cross-trained on work-group tasks	90 percent of work-group cross-trained on new tasks within 10 days
	Agile production processes	Time to market (the time between a product idea and its first sales)	Time to market less than 6 months for 80% of product introductions
	Successful product introductions	New-product market share	Capture 75% of new product market within 6 months

Problems**L02 L03 Evaluating Cost Center Performance**

P 1. Beverage Products, LLC, manufactures metal beverage containers. The division that manufactures soft-drink beverage cans for the North American market has two plants that operate 24 hours a day, 365 days a year. The plants are evaluated as cost centers. Small tools and supplies are considered variable overhead. Depreciation and rent are considered fixed overhead. The master budget for a plant and the operating results of the two North American plants, East Coast and West Coast, are as follows:

	Master Budget	East Coast	West Coast
Center costs			
Rolled aluminum (\$0.01)	\$4,000,000	\$3,492,000	\$5,040,000
Lids (\$0.005)	2,000,000	1,980,000	2,016,000
Direct labor (\$0.0025)	1,000,000	864,000	1,260,000
Small tools and supplies (\$0.0013)	520,000	432,000	588,000
Depreciation and rent	480,000	480,000	480,000
Total cost	<u>\$8,000,000</u>	<u>\$7,248,000</u>	<u>\$9,384,000</u>

Performance measures

Cans processed per hour	45,662	41,096	47,945
Average daily pounds of scrap metal	5	6	7
Cans processed (in millions)	400	360	420

Required

1. Prepare a performance report for the East Coast plant. Include a flexible budget and variance analysis.
2. Prepare a performance report for the West Coast plant. Include a flexible budget and variance analysis.
3. Compare the two plants, and comment on their performance.
4. Explain why a flexible budget should be prepared.

Manager insight ►

L03 Traditional and Variable Costing Income Statements

P 2. Roofing tile is the major product of the Tops Corporation. The company had a particularly good year, as shown by its operating data. It sold 88,400 cases of tile. Variable cost of goods sold was \$848,640; variable selling expenses were \$132,600; fixed overhead was \$166,680; fixed selling expenses were \$152,048; and fixed administrative expenses were \$96,450. Selling price was \$18 per case. There were no partially completed jobs in process at the beginning or the end of the year. Finished goods inventory had been used up at the end of the previous year.

Required

1. Prepare the calendar year-end income statement for the Tops Corporation using the traditional reporting format.
2. Prepare the calendar year-end income statement for the Tops Corporation using the variable costing format.

L02 L03 Evaluating Profit Center and Investment Center Performance**L04**

P 3. Bobbie Howell, the managing partner of the law firm Howell, Bagan, and Clark, LLP, makes asset acquisition and disposal decisions for the firm. As managing partner, she supervises the partners in charge of the firm's three branch offices. Those partners have the authority to make employee compensation decisions. The partners' compensation depends on the profitability of their branch office. Victoria Smith manages the City Branch, which has the following master budget and actual results for the year:

	Master Budget	Actual Results
Billed hours	5,000	4,900
Revenue	\$250,000	\$254,800
Controllable variable costs		
Direct labor	120,000	137,200
Variable overhead	40,000	34,300
Contribution margin	\$ 90,000	\$ 83,300
Controllable fixed costs		
Rent	30,000	30,000
Other administrative expenses	45,000	42,000
Branch operating income	\$ 15,000	\$ 11,300

Required

1. Assume that the City Branch is a profit center. Prepare a performance report that includes a flexible budget. Determine the variances between actual results, the flexible budget, and the master budget.

2. Evaluate Victoria Smith's performance as manager of the City Branch.
3. Assume that the branch managers are assigned responsibility for capital expenditures and that the branches are thus investment centers. City Branch is expected to generate a desired ROI of at least 30 percent on average invested assets of \$40,000.
 - a. Compute the branch's return on investment and residual income.
 - b. Using the ROI and residual income, evaluate Victoria Smith's performance as branch manager.

Manager insight ►

LO4 Return on Investment and Residual Income

P 4. Ornamental Iron is a division of Iron Foundry Company. Its balance sheets and income statements for the past two years appear below.

Iron Foundry Company Ornamental Iron Division Balance Sheet December 31		
	This Year	Last Year
Assets		
Cash	\$ 5,000	\$ 3,000
Accounts receivable	10,000	8,000
Inventory	30,000	32,000
Other current assets	600	600
Plant assets	128,300	120,300
Total assets	\$173,900	\$163,900
Liabilities and Stockholders' Equity		
Current liabilities	\$ 13,900	\$ 10,000
Long-term liabilities	90,000	93,900
Stockholders' equity	70,000	60,000
Total liabilities and stockholders' equity	\$173,900	\$163,900

Iron Foundry Company Ornamental Iron Division Income Statement For the Years Ended December 31		
	This Year	Last Year
Sales	\$180,000	\$160,000
Cost of goods sold	100,000	90,000
Selling and administrative expenses	27,500	26,500
Operating income	\$ 52,500	\$ 43,500
Income taxes expense	17,850	14,790
Net income	\$ 34,650	\$ 28,710

Required

1. Compute the division's profit margin, asset turnover, and return on investment for this year and last year. Beginning total assets for last year were \$157,900. Round to two decimal places.
2. The desired return on investment for the division has been set at 12 percent. Compute Ornamental Iron's residual income for this year and last year.
3. The cost of capital for the division is 8 percent. Compute the division's economic value added for this year and last year.
4. Before drawing conclusions about this division's performance, what additional information would you want?

Manager insight ►**LO4 Return on Investment and Economic Value Added**

P 5. The balance sheet for the New Products Division of NuBone Corporation showed invested assets of \$200,000 at the beginning of the year and \$300,000 at the end of the year. During the year, the division's operating income was \$12,500 on sales of \$500,000.

Required

1. Compute the division's residual income if the desired ROI is 6 percent.
2. Compute the following performance measures for the division: (a) profit margin, (b) asset turnover, and (c) return on investment
3. Recompute the division's ROI under each of the following independent assumptions:
 - a. Sales increase from \$500,000 to \$600,000, causing operating income to rise from \$12,500 to \$30,000.
 - b. Invested assets at the beginning of the year are reduced from \$200,000 to \$100,000.
 - c. Operating expenses are reduced, causing operating income to rise from \$12,500 to \$20,000.
4. Compute NuBone's EVA if total corporate assets are \$500,000, current liabilities are \$80,000, after-tax operating income is \$50,000, and the cost of capital is 8 percent.

Alternate Problems**LO2 LO3 Evaluating Cost Center Performance**

P 6. Plastic Products, LLC, manufactures plastic beverage bottles. The division that manufactures water bottles for the North American market has two plants that operate 24 hours a day, 365 days a year. The plants are evaluated as cost centers. Small tools and supplies are considered variable overhead. Depreciation and rent are considered fixed overhead. The master budget for a plant and the operating results of the two North American plants, North and South, are as follows:

	Master Budget	North Actual	South Actual
Center costs			
Plastic pellets (\$0.009)	\$4,500,000	\$3,880,000	\$5,500,000
Caps (\$0.004)	2,000,000	1,990,000	2,000,000
Direct labor (\$0.002)	1,000,000	865,000	1,240,000
Small tools and supplies (\$0.0005)	250,000	198,000	280,000
Depreciation and rent	450,000	440,000	480,000
Total cost	<u>\$8,200,000</u>	<u>\$7,373,000</u>	<u>\$9,500,000</u>

Performance measures

Bottles processed per hour	69,450	62,000	70,250
Average daily pounds of scrap	5	6	7
Bottles processed (in millions)	500	450	520

Required

1. Prepare a performance report for the North plant. Include a flexible budget and variance analysis.
2. Prepare a performance report for the South plant. Include a flexible budget and variance analysis.
3. Compare the two plants, and comment on their performance.
4. Explain why a flexible budget should be prepared.

Manager insight ▶**LO3 Traditional and Variable Costing Income Statements**

P 7. Interior designers often use the deluxe carpet products of Lux Mills, Inc. The Maricopa blend is the company's top product line. In March, Lux produced and sold 174,900 square yards of Maricopa blend. Factory operating data for the month included variable cost of goods sold of \$2,623,500 and fixed overhead of \$346,875. Other expenses were variable selling expenses, \$166,155; fixed selling expenses, \$148,665; and fixed general and administrative expenses, \$231,500. Total sales revenue equaled \$3,935,250. All production took place in March, and there was no work in process at month end. Goods are usually shipped when completed.

Required

1. Prepare the March income statement for Lux Mills, Inc., using the traditional reporting format.
2. Prepare the March income statement for Lux Mills, Inc., using the variable costing format.

LO2 LO3 Return on Investment and Residual Income

LO4 P 8. Portia Carter is the president of a company that owns six multiplex movie theaters. Carter has delegated decision-making authority to the theater managers for all decisions except those relating to capital expenditures and film selection. The theater managers' compensation depends on the profitability of their theaters. Max Burgman, the manager of the Park Theater, had the following master budget and actual results for the month:

	Master Budget	Actual Results
Tickets sold	120,000	110,000
Revenue—tickets	\$ 840,000	\$ 880,000
Revenue—concessions	480,000	330,000
Total revenue	\$1,320,000	\$1,210,000
Controllable variable costs		
Concessions	120,000	99,000
Direct labor	420,000	330,000
Variable overhead	540,000	550,000
Contribution margin	\$ 240,000	\$ 231,000
Controllable fixed costs		
Rent	55,000	55,000
Other administrative expenses	45,000	50,000
Theater operating income	\$ 140,000	\$ 126,000

Required

1. Assuming that the theaters are profit centers, prepare a performance report for the Park Theater. Include a flexible budget. Determine the variances between actual results, the flexible budget, and the master budget.
2. Evaluate Burgman's performance as manager of the Park Theater.
3. Assume that the managers are assigned responsibility for capital expenditures and that the theaters are thus investment centers. Park Theater is expected to generate a desired ROI of at least 6 percent on average invested assets of \$2,000,000.
 - a. Compute the theater's return on investment and residual income.
 - b. Using the ROI and residual income, evaluate Burgman's performance as manager.

Manager insight ►

LO4 Return on Investment and Residual Income

P 9. The financial results for the past two years for ABB Company, follow.

ABB Company Balance Sheet December 31			
	This Year	Last Year	
Assets			
Cash	\$ 9,000	\$ 4,000	
Accounts receivable	40,000	50,000	
Inventory	30,000	25,000	
Other current assets	1,000	1,000	
Plant assets	<u>120,000</u>	<u>100,000</u>	
Total assets	<u>\$200,000</u>	<u>\$180,000</u>	
Liabilities and Stockholders' Equity			
Current liabilities	\$ 10,000	\$ 10,000	
Long-term Liabilities	20,000	10,000	
Stockholders' equity	<u>170,000</u>	<u>160,000</u>	
Total liabilities and stockholders' equity	<u>\$200,000</u>	<u>\$180,000</u>	

ABB Company Income Statement For the Years Ended December 31			
	This Year	Last Year	
Sales	\$250,000	\$200,000	
Cost of goods sold	150,000	115,000	
Selling and administrative expenses	<u>30,000</u>	<u>25,000</u>	
Operating income	\$ 70,000	\$ 60,000	
Income taxes expense	21,000	18,000	
Net income	<u>\$ 49,000</u>	<u>\$ 42,000</u>	

Required

1. Compute the company's profit margin, asset turnover, and return on investment for this year and last year. Beginning total assets for last year were \$160,000. Round to two decimal places.

Manager insight ►

- The desired return on investment for the company has been set at 10 percent. Compute ABB's residual income for this year and last year.
- The cost of capital for the company is 5 percent. Compute the company's economic value added for this year and last year.
- Before drawing conclusions about this company's performance, what additional information would you want?

LO4 Return on Investment and Economic Value Added

P 10. Micanopy Company makes replicas of Indian artifacts. The balance sheet for the Arrowhead Division showed that the company had invested assets of \$300,000 at the beginning of the year and \$500,000 at the end of the year. During the year, Arrowhead Division's operating income was \$80,000 on sales of \$1,200,000.

Required

- Compute Arrowhead Division's residual income if the desired ROI is 20 percent.
- Compute the following performance measures for the division: (a) profit margin, (b) asset turnover, and (c) return on investment.
- Compute Micanopy Company's economic value added if total corporate assets are \$6,000,000, current liabilities are \$800,000, after-tax operating income is \$750,000, and the cost of capital is 12 percent.

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 Balanced Scorecard Results

C 1. IT, Inc., has adopted the balanced scorecard approach to motivate the managers of its product divisions to work toward the companywide goal of leading its industry in innovation. The corporation's selected performance measures and scorecard results are as follows:

Measure	Division			Performance Target
	A	B	C	
New product ROI	80%	75%	70%	75%
Employees cross-trained in new tasks within 30 days	95	96	94	100
New product's time to market less than one year	85	90	86	80
New product's market share one year after introduction	50	100	80	80

Can you effectively compare the performance of the three divisions against the targets? What other measures mentioned in this chapter are needed to evaluate performance effectively?

LO1 LO2 Responsibility Centers

C 2. Wood4Fun makes wooden playground equipment for the institutional and consumer markets. The company strives for low-cost, high-quality production because it operates in a highly competitive market in which product price is set by the marketplace and is not based on production costs. The company is organized into responsibility centers. The vice president of manufacturing is responsible for three manufacturing plants. The vice president of sales is responsible for four sales

regions. Recently, these two vice presidents began to disagree about whether the manufacturing plants are cost centers or profit centers. The vice president of manufacturing views the plants as cost centers because the managers of the plants control only product-related costs. The vice president of sales believes the plants are profit centers because product quality and product cost strongly affect company profits.

1. Identify the controllable performance that Wood4Fun values and wants to measure. Give at least three examples of performance measures that Wood4Fun could use to monitor such performance.
2. For the manufacturing plants, what type of responsibility center is most consistent with the controllable performance Wood4Fun wants to measure?
3. For the sales regions, what type of responsibility center is most appropriate?

L01 L02 Types of Responsibility Centers

L03 L05 C 3. Yuma Foods acquired Aldo's Tortillas several years ago. Aldo's has continued to operate as an independent company, except that Yuma Foods has exclusive authority over capital investments, production quantity, and pricing decisions because Yuma has been Aldo's only customer since the acquisition. Yuma uses return on investment to evaluate the performance of Aldo's manager. The most recent performance report is as follows:

Yuma Foods Performance Report for Aldo's Tortillas For the Year Ended June 30	
Sales	\$6,000
Variable cost of goods sold	3,000
Variable administrative expenses	1,000
Variable corporate expenses (% of sales)	600
Contribution margin	\$1,400
Fixed overhead (includes depreciation of \$100)	400
Fixed administrative expenses	500
Operating income	\$ 500
Average assets invested	\$5,500
Return on investment	9.09% *

*Rounded.

1. Analyze the items listed in the performance report, and identify the items that Aldo controls and those that Yuma controls. In your opinion, what type of responsibility center is Aldo's Tortillas? Explain your response.
2. Prepare a revised performance report for Aldo's Tortillas and an accompanying memo to the president of Yuma Foods that explains why it is important to change the content of the report. Cite some basic principles of responsibility accounting to support your recommendation.

L01 L04 Economic Value Added and Performance

L05 C 4. Sevilla Consulting offers environmental consulting services worldwide. The managers of branch offices are rewarded for superior performance with bonuses based on the economic value that the office adds to the company. Last year's operating results for the entire company and for its three offices, expressed in millions of U.S. dollars, are as follows:

	Worldwide	Europe	Americas	Asia
Cost of capital	9%	10%	8%	12%
Total assets	\$210	\$70	\$70	\$70
Current liabilities	\$80	\$10	\$40	\$30
After-tax operating income	\$15	\$5	\$5	\$5

1. Compute the economic value added for each office worldwide. What factors affect each office’s economic value added? How can an office improve its economic value added?
2. If managers’ bonuses are based on economic value added to office performance, what specific actions will managers be motivated to take?
3. Is economic value added the only performance measure needed to evaluate investment centers adequately? Explain your response.

LO4 Return on Investment and Residual Income

C5. Suppose Alexandra Patel, the manager of the Food and Lodging Division at Winter Wonderland Resort, has hired you as a consultant to help her examine her division’s performance under several different circumstances.

1. Type the data that follow into an Excel spreadsheet to compute the division’s actual return on investment and residual income. (Data are from parts 3 and 4 of this chapter’s Review Problem.) Match your data entries to the rows and columns shown below. (**Hint:** Remember to format each cell for the type of numbers it holds, such as percentage, currency, or general.)

	A	B	C	D
1				Investment Center
2				Food and Lodging Division
3				Actual Results
4	Sales			\$40,000,000
5	Operating income			\$ 6,450,000
6	Average assets invested			\$10,000,000
7	Desired ROI			30%
8	Return on Investment			=(D5/D6)
9	Profit Margin			=(D5/D4)
10	Asset Turnover			=(D4/D6)
11	Residual Income			=[D5-(D7*D6)]
12				

2. Patel would like to know how the figures would change if Food and Lodging had a desired ROI of 40 percent and average assets invested of \$10,000,000. Revise your spreadsheet from 1 to compute the division’s return on investment and residual income under those conditions.
3. Patel also wants to know how the figures would change if Food and Lodging had a desired ROI of 30 percent and average assets invested of \$12,000,000. Revise your spreadsheet from 1 to compute the division’s return on investment and residual income under those conditions.
4. Does the use of formatted spreadsheets simplify the computation of ROI and residual income? Do such spreadsheets make it easier to perform “what-if” analyses?

LO4 Cookie Company (Continuing Case)

C 6. As we continue with this case, assume that your cookie store is now part of a national chain. The store has been consistently profitable, and sales remain satisfactory despite a temporary economic downturn in your area.

At the first of the year, corporate headquarters set a targeted return on investment of 20 percent for your store. The store currently averages \$140,000 in invested assets (beginning invested assets, \$130,000; ending invested assets, \$150,000) and is projected to have an operating income of \$30,800. You are considering whether to take one or both of the following actions before the end of the year:

- ▶ Hold off recording and paying \$5,000 in bills owed until the start of the next fiscal year.
- ▶ Write down to zero value \$3,000 in store inventory (nonperishable containers) that you have been unable to sell.

Currently, your bonus is based on store profits. Next year, corporate headquarters is changing its performance incentive program so that bonuses will be based on a store's actual return on investment.

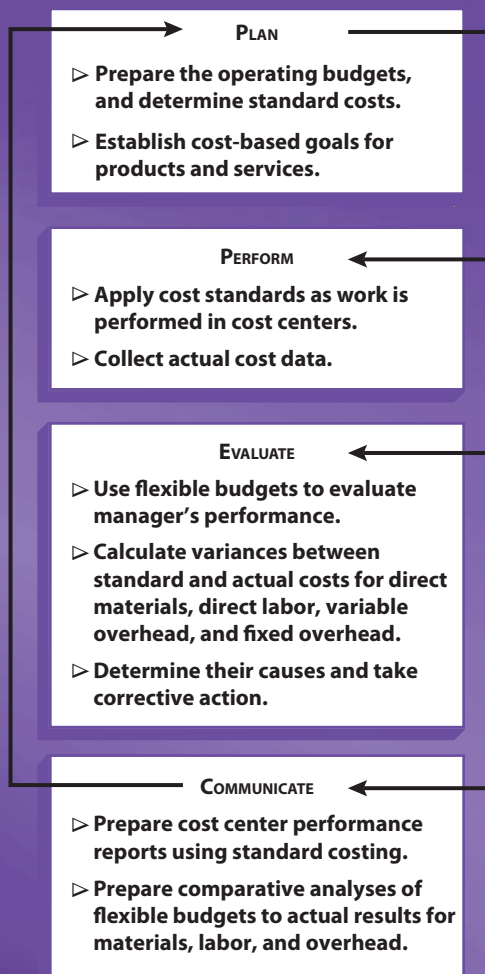
1. What effect would each of the actions that you are considering have on the store's operating income this year? (**Hint:** Use Figure 8-3 to trace the effects.) In your opinion, is either action unethical?
2. Independent of question 1, how would the inventory write-down affect next year's income and return on investment if the inventory is sold for \$4,000 next year, when corporate headquarters changes its performance incentive plan for store managers? In your opinion, do you have an ethical dilemma?

CHAPTER

9

Standard Costing and Variance Analysis

The Management Process



Use standard costing and flexible budgets to evaluate the performance cost centers.

Standard costs are useful tools for management because they are based on realistic estimates of operating costs. Managers use them to develop budgets, to control costs, and to prepare reports. Because of their usefulness in comparing planned and actual costs, standard costs have usually been most closely associated with the performance evaluation of cost centers. In this chapter, we describe how standard costs are computed and how managers use the variances between standard and actual costs to evaluate performance and control costs.

LEARNING OBJECTIVES

- LO1** Define *standard costs*, explain how standard costs are developed, and compute a standard unit cost. (pp. 346–350)
- LO2** Prepare a flexible budget, and describe how managers use variance analysis to control costs. (pp. 350–354)
- LO3** Compute and analyze direct materials variances. (pp. 355–357)
- LO4** Compute and analyze direct labor variances. (pp. 358–361)
- LO5** Compute and analyze overhead variances. (pp. 361–368)
- LO6** Explain how variances are used to evaluate managers' performance. (pp. 369–370)

DECISION POINT ► A MANAGER'S FOCUS iROBOT CORPORATION

Known for its floor-cleaning home robots, Roomba and Scooba, **iRobot Corporation** is a leader in the emerging robotics industry. Its PackBot, a combat-proven mobile robot, has saved many lives by performing hazardous reconnaissance, search, and bomb disposal duties in battle zones worldwide. As iRobot develops the next generation of robots for military, industrial, and home use, its managers will continue to keep the business highly profitable by using design specifications to set standard costs for the company's product lines. Managers in all types of companies use these figures as performance targets and as benchmarks against which to measure actual spending trends and monitor changes in business conditions.

- How does setting performance standards help managers control costs?
- How do managers use standard costs to evaluate the performance of cost centers?



Standard Costing

LO1 Define *standard costs*, explain how standard costs are developed, and compute a standard unit cost.

Standard costs are realistic estimates of costs based on analyses of both past and projected operating costs and conditions. They are usually stated in terms of cost per unit. They provide a standard, or predetermined, performance level for use in **standard costing**, a method of cost control that also includes a measure of actual performance and a measure of the difference, or **variance**, between standard and actual performance. This method of measuring and controlling costs differs from the actual and normal costing methods in that it uses estimated costs exclusively to compute all three elements of product cost—direct materials, direct labor, and overhead.

Standard costing is especially effective for managing cost centers. You may recall that a cost center is a responsibility center in which there are well-defined links between the cost of the resources (direct materials, direct labor, and overhead) and the resulting products or services.

A disadvantage to using standard costing is that it can be expensive because the estimated costs are based not just on past costs, but also on engineering estimates, forecasted demand, worker input, time and motion studies, and type and quality of direct materials. However, this method can be used in any type of business. Both manufacturers and service businesses can use standard costing in conjunction with a job order costing, process costing, or activity-based costing system.

Standard Costs and Managers

As we noted in the introduction to this chapter, standard costs are useful tools for management. Managers use them to develop budgets, to control costs, and to prepare reports. Because of their usefulness in comparing planned and actual costs, standard costs have usually been most closely associated with the performance evaluation of cost centers.

In recent years, the increasing automation of manufacturing processes has caused a significant decrease in direct labor costs and a corresponding decline in the importance of labor-related standard costs and variances. As a result, managers at manufacturing companies, which once used standard costing for all three elements of product cost, may now apply this method only to direct materials and overhead.

Today, many service organizations' managers also use standard costing. Although a service organization has no direct materials costs, labor and overhead costs are very much a part of providing services, and standard costing is an effective way of planning and controlling them.

Study Note

Standard costs are necessary for planning and control. Budgets are developed from standard costs, and performance is measured against them.



FOCUS ON BUSINESS PRACTICE

Why Go on a Factory Tour?

If you've had some manufacturing experience, you probably understand the importance of standard costing and variance analysis. If you haven't had any manufacturing experience, you can gain insight into the importance of cost planning and control by visiting a factory. Consult

your local chamber of commerce for factory tours near you. You can also tour factories online. Check out the virtual production tour of jelly beans at www.jellybelly.com or see how chocolate is made at www.hersheys.com.

Computing Standard Costs

A fully integrated standard costing system uses standard costs for all the elements of product cost: direct materials, direct labor, and overhead. Inventory accounts for materials, work in process, and finished goods, as well as the Cost of Goods Sold account, are maintained and reported in terms of standard costs, and standard unit costs are used to compute account balances. Actual costs are recorded separately so that managers can compare what should have been spent (the standard costs) with the actual costs incurred in the cost center.

A standard unit cost for a manufactured product has the following six elements:

- ▶ Price standard for direct materials
- ▶ Quantity standard for direct materials
- ▶ Standard for direct labor rate
- ▶ Standard for direct labor time
- ▶ Standard for variable overhead rate
- ▶ Standard for fixed overhead rate

To compute a standard unit cost, it is necessary to identify and analyze each of these elements. (A standard unit cost for a service includes only the elements that relate to direct labor and overhead.)

Standard Direct Materials Cost

The **standard direct materials cost** is found by multiplying the price standard for direct materials by the quantity standard for direct materials. For example, if the price standard for a certain item is \$2.75 and a specific job calls for a quantity standard of 8 of the items, the standard direct materials cost for that job is computed as follows:

$$\begin{array}{rclcl} \text{Standard Direct} & & \text{Direct Materials} & \times & \text{Direct Materials} \\ \text{Materials Cost} & = & \text{Price Standard} & \times & \text{Quantity Standard} \\ \$22.00 & = & \$2.75 & \times & 8 \end{array}$$

The **direct materials price standard** is a careful estimate of the cost of a specific direct material in the next accounting period. An organization's purchasing agent or its purchasing department is responsible for developing price standards for all direct materials and for making the actual purchases. When estimating a direct materials price standard, the purchasing agent or department must take into account all possible price increases, changes in available quantities, and new sources of supply.

The **direct materials quantity standard** is an estimate of the amount of direct materials, including scrap and waste, that will be used in an accounting period. It is influenced by product engineering specifications, the quality of direct materials, the age and productivity of machinery, and the quality and experience of the work force. Production managers or management accountants usually establish and monitor standards for direct materials quantity, but engineers, purchasing agents, and machine operators may also contribute to the development of these standards.

Standard Direct Labor Cost

The **standard direct labor cost** for a product, task, or job order is calculated by multiplying the standard wage for direct labor by the standard hours of direct labor. For example, if the standard direct labor rate is \$8.40 per hour and a

product takes 1.5 standard direct labor hours to produce, the product's standard direct labor cost is computed as follows:

$$\begin{array}{rclcl} \text{Standard Direct} & = & \text{Direct Labor} & \times & \text{Direct Labor} \\ \text{Labor Cost} & = & \text{Rate Standard} & \times & \text{Time Standard} \\ \$12.60 & = & \$8.40 & \times & 1.5 \text{ hours} \end{array}$$

Study Note

Both the direct labor rate standard and the direct labor time standard are based on an average of the different levels of skilled workers, and both are related to the production of one unit or batch.

The **direct labor rate standard** is the hourly direct labor rate that is expected to prevail during the next accounting period for each function or job classification. Although rate ranges are established for each type of worker and rates vary within those ranges according to each worker's experience and length of service, an average standard rate is developed for each task. Even if the person making the product is paid more or less than the standard rate, the standard rate is used to calculate the standard direct labor cost. Standard labor rates are fairly easy to develop because labor rates are either set by a labor union contract or defined by the company.

The **direct labor time standard** is the expected labor time required for each department, machine, or process to complete the production of one unit or one batch of output. In many cases, standard time per unit is a small fraction of an hour. Current time and motion studies of workers and machines, as well as records of their past performance, provide the data for developing this standard. The direct labor time standard should be revised whenever a machine is replaced or the quality of the labor force changes.

Standard Overhead Cost

The **standard overhead cost** is the sum of the estimates of variable and fixed overhead costs in the next accounting period. It is based on standard overhead rates that are computed in much the same way as the predetermined overhead rate that we discussed in an earlier chapter. Unlike that rate, however, the standard overhead rate has two parts, one for variable costs and one for fixed costs. The reason for computing the standard variable and fixed overhead rates separately is that their cost behavior differs.

The **standard variable overhead rate** is computed by dividing the total budgeted variable overhead costs by an expression of capacity, such as the number of standard machine hours or standard direct labor hours. (Other bases may be used if machine hours or direct labor hours are not good predictors, or drivers, of variable overhead costs.) For example, using standard machine hours as the base, the formula is as follows:

$$\text{Standard Variable Overhead Rate} = \frac{\text{Total Budgeted Variable Overhead Costs}}{\text{Expected Number of Standard Machine Hours}}$$

The **standard fixed overhead rate** is computed by dividing the total budgeted fixed overhead costs by an expression of capacity, usually normal capacity in terms of standard hours or units. The denominator is expressed in the same terms as the variable overhead rate. For example, using normal capacity in terms of standard machine hours as the denominator, the formula is as follows:

$$\text{Standard Fixed Overhead Rate} = \frac{\text{Total Budgeted Fixed Overhead Costs}}{\text{Normal Capacity in Terms of Standard Machine Hours}}$$

Recall that normal capacity is the level of operating capacity needed to meet expected sales demand. Using it as the application base ensures that all fixed overhead costs have been applied to units produced by the time normal capacity is reached.

Total Standard Unit Cost

Using standard costs eliminates the need to calculate unit costs from actual cost data every week or month or for each batch of goods produced. Once standard costs for direct materials, direct labor, and variable and fixed overhead have been developed, a total standard unit cost can be computed at any time.

To illustrate how standard costs are used to compute total unit cost, let's suppose that a company called ICU, Inc., has adapted **iRobot Corporation's** technology to create Watch Dog, a robot used for home surveillance. ICU, Inc., has recently updated the standards for this line of robots. Direct materials price standards are now \$9.20 per square foot for casing materials and \$20.17 for each mechanism. Direct materials quantity standards are 0.025 square foot of casing materials per robot and one mechanism per robot. Direct labor time standards are 0.01 hour per robot for the Case Stamping Department and 0.05 hour per robot for the Assembly Department. Direct labor rate standards are \$8.00 per hour for the Case Stamping Department and \$10.20 per hour for the Assembly Department. Standard manufacturing overhead rates are \$12.00 per direct labor hour for the standard variable overhead rate and \$9.00 per direct labor hour for the standard fixed overhead rate. The standard cost of making one robot would be computed in the following manner:

Direct materials costs:

Casing (\$9.20 per sq. ft. × 0.025 sq. ft.)	\$ 0.23
One mechanism	20.17

Direct labor costs:

Case Stamping Department (\$8.00 per hour × 0.01 hour per robot)	0.08
Assembly Department (\$10.20 per hour × 0.05 hour per robot)	0.51
Variable overhead (\$12.00 per hour × 0.06 hour per robot)	<u>0.72</u>
Total standard variable cost of one robot	\$21.71
Fixed overhead (\$9.00 per hour × 0.06 hour per robot)	<u>0.54</u>
Total standard cost of one robot	<u><u>\$22.25</u></u>

Study Note

The total standard cost of \$22.25 represents the *desired* cost of producing one robot.

The total standard cost of producing a watch like this or a robot like the Watch Dog represents the desired production cost. It is based on the standards established for direct materials costs, direct labor costs, and variable and fixed overhead.

Courtesy of Timothy Goodwin/
istockphoto.com.




STOP & APPLY >

Using the following information, compute the standard unit cost of a 5-pound bag of sugar:

Direct materials quantity standard	5 pounds per unit
Direct materials price standard	\$0.05 per pound
Direct labor time standard	0.01 hour per unit
Direct labor rate standard	\$10.00 per hour
Variable overhead rate standard	\$0.15 per machine hour
Fixed overhead rate standard	\$0.10 per machine hour
Machine hour standard	0.5 hour per unit

SOLUTION

Direct materials cost ($\$0.05 \times 5$ pounds)	\$0.25
Direct labor cost ($\$10.00 \times 0.01$ hour)	0.10
Variable overhead ($\$0.15 \times 0.5$ machine hour)	0.08
Fixed overhead ($\$0.10 \times 0.5$ machine hour)	0.05
Total standard unit cost	<u>\$0.48</u>

Variance Analysis

LO2 Prepare a flexible budget, and describe how managers use variance analysis to control costs.

Managers in all types of organizations constantly compare the costs of what was expected to happen with the costs of what actually did happen. By examining the differences, or variances, between standard and actual costs, they can gather much valuable information. **Variance analysis** is the process of computing the differences between standard costs and actual costs and identifying the causes of those differences. In this section, we look at how managers use flexible budgets to improve the accuracy of variance analysis and how they use variance analysis to control costs.

The Role of Flexible Budgets in Variance Analysis

The accuracy of variance analysis depends to a large extent on the type of budget that managers use when comparing variances. Static, or fixed, budgets forecast revenues and expenses for just one level of sales and just one level of output. The budgets that make up a master budget are usually based on a single level of output, but many things can happen over an accounting period that will cause actual output to differ from the estimated output. If a company produces more products than predicted, total production costs will almost always be greater than predicted. When that is the case, a comparison of actual production costs with fixed budgeted costs will inevitably show variances.

The performance report in Exhibit 9-1 compares data from the static master budget of ICU, Inc., with the actual costs of the company's Watch Division, the division responsible for manufacturing the surveillance robots, for the year ended December 31. As you can see, actual costs exceeded budgeted costs by \$5,539. On the face of it, most managers would consider such a cost overrun significant. But was there really a cost overrun? The budgeted amounts are based on an output of 17,500 units; however, the actual output was 19,100 units.

To judge the division's performance accurately, the company's managers must change the budgeted data to reflect an output of 19,100 units. They can do this by using a flexible budget. A **flexible budget** (also called a *variable budget*) is a summary of expected costs for a range of activity levels. Unlike a static budget, a flexible budget provides forecasted data that can be adjusted for changes in

EXHIBIT 9-1

Performance Report Using Data
from a Static Budget

ICU, Inc.
Performance Report—Watch Division
For the Year Ended December 31

Cost Category	Budgeted Costs*	Actual Costs [†]	Difference Under (Over) Budget
Direct materials	\$357,000	\$361,000	(\$4,000)
Direct labor	10,325	11,779	(1,454)
Variable overhead			
Indirect materials	3,500	3,600	(100)
Indirect labor	5,250	5,375	(125)
Utilities	1,750	1,810	(60)
Other	2,100	2,200	(100)
Fixed overhead			
Supervisory salaries	4,000	3,500	500
Depreciation	2,000	2,000	—
Utilities	450	450	—
Other	3,000	3,200	(200)
Totals	<u>\$389,375</u>	<u>\$394,914</u>	<u>(\$5,539)</u>

*Budgeted costs are based on an output of 17,500 units.

[†]Actual output was 19,100 units.

the level of output. The flexible budget is used primarily as a cost control tool in evaluating performance at the end of a period.

A flexible budget for ICU's Watch Division appears in Exhibit 9-2. It shows the estimated costs for 15,000, 17,500, and 20,000 units of output. The total cost of a variable cost item is found by multiplying the number of units produced by the item's per unit cost. For example, if the Watch Division produces 15,000 units, direct materials will cost \$306,000 (15,000 units × \$20.40).

An important element in this exhibit is the **flexible budget formula**, an equation that determines the expected, or budgeted, cost for any level of output. Its components include a per unit amount for variable costs and a total amount for fixed costs. (In Exhibit 9-2, the \$21.71 variable cost per unit is computed in the far right column, and the \$9,450 is found in the section on fixed overhead costs.) Using the flexible budget formula, you can create a budget for the Watch Division for any level of output in the range of levels given.



FOCUS ON BUSINESS PRACTICE

Why Complicate the Flexible Budget?

Because of the database capabilities of enterprise resource management (ERM) systems and the principles of resource consumption accounting (RCA), the flexible budget has become more complicated. This new and more complex version of a flexible budget is called *authorized reporting*. Authorized reporting is like a flexible budget in that it

restates an accounting period's costs in terms of different levels of output, but it enhances cost restatement by taking into account all the factors that can influence a cost's behavior. With its sophisticated cost analyses, authorized reporting is a more relevant yardstick for cost comparison and control than the traditional flexible budget.¹

EXHIBIT 9-2

Flexible Budget for Evaluation of Overall Performance

ICU, Inc.				
Flexible Budget—Watch Division				
For the Year Ended December 31				
Cost Category	Units Produced*			Variable Cost per Unit†
	15,000	17,500	20,000	
Direct materials	\$306,000	\$357,000	\$408,000	\$20.40
Direct labor	8,850	10,325	11,800	0.59
Variable overhead				
Indirect materials	3,000	3,500	4,000	0.20
Indirect labor	4,500	5,250	6,000	0.30
Utilities	1,500	1,750	2,000	0.10
Other	1,800	2,100	2,400	0.12
Total variable costs	<u>\$325,650</u>	<u>\$379,925</u>	<u>\$434,200</u>	<u>\$21.71</u>
Fixed overhead				
Supervisory salaries	\$ 4,000	\$ 4,000	\$ 4,000	
Depreciation	2,000	2,000	2,000	
Utilities	450	450	450	
Other	3,000	3,000	3,000	
Total fixed overhead costs	<u>\$ 9,450</u>	<u>\$ 9,450</u>	<u>\$ 9,450</u>	
Total costs	<u>\$335,100</u>	<u>\$389,375</u>	<u>\$443,650</u>	

Flexible budget formula:

$$\begin{aligned} \text{Total Budgeted Costs} &= (\text{Variable Cost per Unit} \times \text{Number of Units Produced}) \\ &\quad + \text{Budgeted Fixed Costs} \\ &= (\$21.71 \times \text{Units Produced}) + \$9,450 \end{aligned}$$

*Flexible budgets are commonly used only for overhead costs; when they are, machine hours or direct labor hours are used in place of units produced.

†Computed by dividing the dollar amount in any column by the respective level of output.

Study Note

Flexible budgets allow managers to compare budgeted and actual costs at the same level of output.

The performance report in Exhibit 9-3 is based on data from the flexible budget shown in Exhibit 9-2. Variable unit costs have been multiplied by the 19,100 units actually produced to arrive at the total flexible budgeted costs, and fixed overhead information has been carried over from Exhibit 9-2. In this report, actual costs are \$29,197 less than the amount budgeted. In other words, when we use a flexible budget at the end of the period, we find that the performance of the Watch Division in this period actually exceeded budget targets by \$29,197.

Using Variance Analysis to Control Costs

As Figure 9-1 shows, using variance analysis to control costs is a four-step process. First, managers compute the amount of the variance. If the amount is insignificant—meaning that actual operating results are close to those anticipated—no corrective action is needed. If the amount is significant, then managers analyze the variance to identify its cause. In identifying the cause, they are usually able to pinpoint the activities that need to be monitored. They then select performance measures that will enable them to track those activities, analyze the results, and determine the action needed to correct the problem. Their final step is to take the appropriate corrective action.

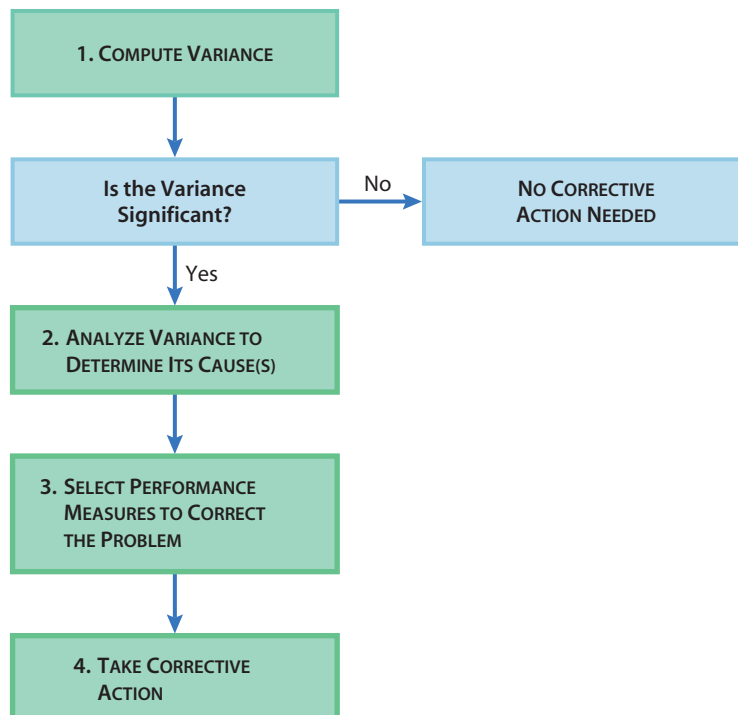
EXHIBIT 9-3
Performance Report Using Data
from a Flexible Budget

ICU, Inc.			
Performance Report—Watch Division			
For the Year Ended December 31			
Cost Category (Variable Unit Cost)	Budgeted Costs*	Actual Costs	Difference Under (Over) Budget
Direct materials (\$20.40)	\$389,640	\$361,000	\$28,640
Direct labor (\$0.59)	11,269	11,779	(510)
Variable overhead			
Indirect materials (\$0.20)	3,820	3,600	220
Indirect labor (\$0.30)	5,730	5,375	355
Utilities (\$0.10)	1,910	1,810	100
Other (\$0.12)	2,292	2,200	92
Fixed overhead			
Supervisory salaries	4,000	3,500	500
Depreciation	2,000	2,000	—
Utilities	450	450	—
Other	3,000	3,200	(200)
Totals	<u><u>\$424,111</u></u>	<u><u>\$394,914</u></u>	<u><u>\$29,197</u></u>

*Budgeted costs are based on an output of 19,100 units.

Although computing the amount of a variance is important, it is also important to remember that this computation does nothing to prevent the variance from recurring. To control costs, managers must determine the cause of the variance and select performance measures that will help them track the problem and find the best solution for it.

FIGURE 9-1
Variance Analysis: A Four-Step
Approach to Controlling Costs



As we focus on the computation and analysis of cost center variances in the next sections, we follow the steps outlined in Figure 9-1. We limit our analysis to eight variances, two for each of the cost categories of direct materials, direct labor, variable overhead, and fixed overhead. We give examples of operating problems that might cause each of these variances to occur. We also identify some financial and nonfinancial performance measures that can be used to track the cause of a variance and that can be helpful in correcting it.

STOP & APPLY >

Keel Company's fixed overhead costs for the year are expected to be as follows: depreciation, \$72,000; supervisory salaries, \$92,000; property taxes and insurance, \$26,000; and other fixed overhead, \$14,500. Total fixed overhead is thus expected to be \$204,500. Variable costs per unit are expected to be as follows: direct materials, \$16.50; direct labor, \$8.50; operating supplies, \$2.60; indirect labor, \$4.10; and other variable overhead costs, \$3.20.

Prepare a flexible budget for the following levels of production: 18,000 units, 20,000 units, and 22,000 units. What is the flexible budget formula for the year ended December 31?

SOLUTION

Keel Company Flexible Budget For the Year Ended December 31

Cost Category	Units Produced			Variable Cost per Unit
	18,000	20,000	22,000	
Direct materials	\$297,000	\$330,000	\$363,000	\$16.50
Direct labor	153,000	170,000	187,000	8.50
Variable overhead				
Operating supplies	46,800	52,000	57,200	2.60
Indirect labor	73,800	82,000	90,200	4.10
Other	57,600	64,000	70,400	3.20
Total variable costs	<u>\$628,200</u>	<u>\$698,000</u>	<u>\$767,800</u>	<u>\$34.90</u>
Fixed overhead				
Depreciation	\$ 72,000	\$ 72,000	\$ 72,000	
Supervisory salaries	92,000	92,000	92,000	
Property taxes and insurance	26,000	26,000	26,000	
Other	14,500	14,500	14,500	
Total fixed overhead	<u>\$204,500</u>	<u>\$204,500</u>	<u>\$204,500</u>	
Total costs	<u>\$832,700</u>	<u>\$902,500</u>	<u>\$972,300</u>	

Flexible budget formula for the year ended December 31:

Total Budgeted Costs = (\$34.90 × Units Produced) + \$204,500

Computing and Analyzing Direct Materials Variances

L03 Compute and analyze direct materials variances.

To control cost center operations, managers compute and analyze variances for whole cost categories, such as total direct materials costs, as well as variances for elements of those categories, such as the price and quantity of each direct material. The more detailed their analysis of direct materials variances is, the more effective they will be in controlling costs.

Computing Direct Materials Variances

The **total direct materials cost variance** is the difference between the standard cost and actual cost of direct materials used to produce the salable units; it is also referred to as the *good units produced*. To illustrate how this variance is computed, let us assume that a manufacturer called Cambria Company makes leather bags to carry the Watch Dog robots. Each bag should use 4 feet of leather (standard quantity), and the standard price of leather is \$6.00 per foot. During August, Cambria Company purchased 760 feet of leather costing \$5.90 per foot and used the leather to produce 180 bags.

Given these facts, the total direct materials cost variance for Cambria is calculated as follows:

Standard cost

$$\begin{aligned} \text{Standard Price} \times \text{Standard Quantity} &= \\ \$6.00 \text{ per foot} \times (180 \text{ bags} \times 4 \text{ feet per bag}) &= \\ \$6.00 \text{ per foot} \times 720 \text{ feet} &= \$4,320 \end{aligned}$$

Less actual cost

$$\begin{aligned} \text{Actual Price} \times \text{Actual Quantity} &= \\ \$5.90 \text{ per foot} \times 760 \text{ feet} &= \underline{4,484} \\ \text{Total direct materials cost variance} &= \underline{\underline{\$ 164}} \text{ (U)} \end{aligned}$$

Here, actual cost exceeds standard cost. The situation is unfavorable, as indicated by the U in parentheses after the dollar amount. An F means a favorable situation.

To find the area or people responsible for the variance, the total direct materials cost variance must be broken down into two parts: the direct materials price variance and the direct materials quantity variance. The **direct materials price variance** (also called the *direct material spending or rate variance*) is the difference between the standard price and the actual price per unit multiplied by the actual quantity purchased.

For Cambria Company, the direct materials price variance is computed as follows:

Standard price	\$6.00
Less actual price	<u>5.90</u>
Difference per foot	<u>\$0.10 (F)</u>

$$\begin{aligned} \text{Direct Materials Price Variance} &= (\text{Standard Price} - \text{Actual Price}) \\ &\quad \times \text{Actual Quantity} \\ &= \$0.10 \times 760 \text{ feet} \\ &= \underline{\underline{\$76}} \text{ (F)} \end{aligned}$$

Because the price that the company paid for the direct materials was less than the standard price it expected to pay, the variance is favorable.

The **direct materials quantity variance** (also called the *direct material efficiency or usage variance*) is the difference between the standard quantity

Study Note

It is just as important to identify whether a variance is favorable or unfavorable as it is to compute the variance. This information is necessary for analyzing the variance and taking corrective action.

Study Note

The direct materials price variance measures the difference between the standard cost and the actual cost of purchased materials. It is not concerned with the quantity of materials used in the production process.

allowed and the actual quantity used multiplied by the standard price. For Cambria, it is computed as follows:

Standard quantity allowed (180 bags	720 feet
× 4 feet per bag)	720 feet
Less actual quantity	<u>760 feet</u>
Difference	<u>40 feet (U)</u>

$$\begin{aligned}
 \text{Direct Materials Quantity Variance} &= \text{Standard Price} \times (\text{Standard Quantity Allowed} - \text{Actual Quantity}) \\
 &= \$6 \times 40 \text{ feet} \\
 &= \underline{\underline{\$240 (U)}}
 \end{aligned}$$

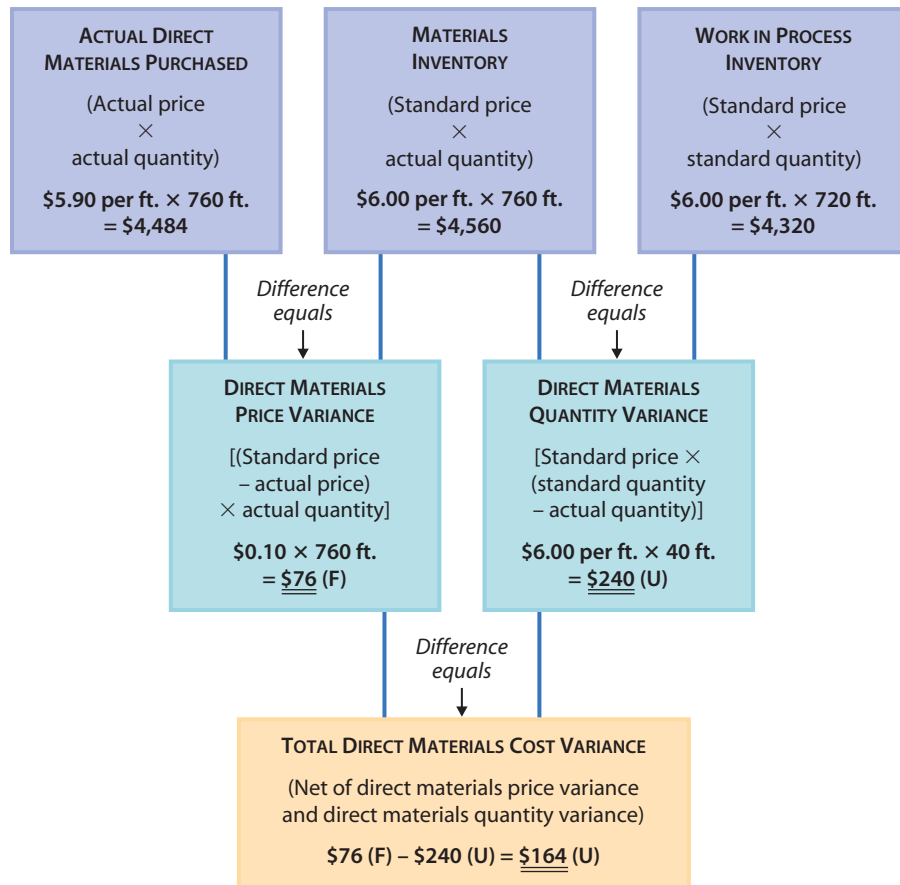
Because more leather than the standard quantity was used in the production process, the direct materials quantity variance is unfavorable.

Summary of Direct Material Variances If the calculations are correct, the net of the direct materials price variance and the direct materials quantity variance should equal the total direct materials cost variance. The following check shows that the variances were computed correctly:

Direct materials price variance	\$ 76 (F)
Direct materials quantity variance	<u>240 (U)</u>
Total direct materials cost variance	<u><u>\$164 (U)</u></u>

Variance analyses are sometimes easier to interpret in diagram form. Figure 9-2 illustrates our analysis of Cambria Company’s direct materials variances. Notice that although direct materials are purchased at actual cost, they are entered in the Materials Inventory account at standard price; thus, the direct materials price variance of

FIGURE 9-2
Diagram of Direct Materials Variance Analysis



\$76 (F) is obvious when the costs are recorded. As Figure 9-2 shows, the standard price multiplied by the standard quantity is the amount entered in the Work in Process Inventory account.

Analyzing and Correcting Direct Materials Variances

Cambria Company's managers were concerned because the company had been experiencing direct materials price variances and quantity variances for some time; moreover, as our analysis shows, the price variances were always favorable and the quantity variances were always unfavorable. By tracking the purchasing activity for three months, the managers discovered that the company's purchasing agent, without any authorization, had been purchasing a lower grade of leather at a reduced price. After careful analysis, the engineering manager determined that the substitute leather was not appropriate and that the company should resume purchasing the grade of leather originally specified. In addition, an analysis of scrap and rework revealed that the inferior quality of the substitute leather was causing the unfavorable quantity variance. By tracking the purchasing activity, Cambria's managers were able to solve the problems the company had been having with direct materials variances.

STOP & APPLY >

Using the following information, compare the actual and standard cost and usage data for the production of 5-pound bags of sugar, and compute the direct materials price and direct materials quantity variances using formulas or diagram form:

Direct materials quantity standard	5 pounds per unit
Direct materials price standard	\$0.05 per pound
Direct materials purchased and used	55,100 pounds
Price paid for direct materials	\$0.04 per pound
Number of good units produced	11,000 units

SOLUTION

$$\begin{aligned} \text{Direct Materials Price Variance} &= (\text{Standard Price} - \text{Actual Price}) \times \text{Actual Quantity} \\ &= (\$0.05 - \$0.04) \times 55,100 \text{ pounds} \\ &= \$0.01 \times 55,100 \text{ pounds} = \underline{\underline{\$551}} \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{Direct Materials Quantity Variance} &= \text{Standard Price} \times (\text{Standard Quantity} - \text{Actual Quantity}) \\ &= \$0.05 \times [(11,000 \times 5 \text{ pounds}) - 55,100 \text{ pounds}] \\ &= \$0.05 \times (55,000 \text{ pounds} - 55,100 \text{ pounds}) = \underline{\underline{\$5}} \text{ (U)} \end{aligned}$$

Diagram Form:

	Actual Price × Actual Quantity		Standard Price × Actual Quantity		Standard Price × Standard Quantity
Direct Materials	\$2,204 ^a	Price Variance	\$2,755 ^b	Quantity Variance	\$2,750 ^c
		\$551 (F)		\$5 (U)	

^a \$0.04 × 55,100 = \$2,204

^b \$0.05 × 55,100 = \$2,755

^c \$0.05 × (11,000 × 5) = \$2,750

Computing and Analyzing Direct Labor Variances

LO4 Compute and analyze direct labor variances.

The procedure for computing and analyzing direct labor cost variances parallels the procedure for finding direct materials variances. Again, the more detailed the analysis is, the more effective managers will be in controlling costs.

Computing Direct Labor Variances

The **total direct labor cost variance** is the difference between the standard direct labor cost for good units produced and actual direct labor costs. (*Good units* are the total units produced less units that are scrapped or need to be reworked—in other words, the salable units.) At Cambria Company, each leather bag requires 2.4 standard direct labor hours, and the standard direct labor rate is \$8.50 per hour. During August, 450 direct labor hours were used to make 180 bags at an average pay rate of \$9.20 per hour.

Based on these facts, the total direct labor cost variance is computed as follows:

Standard cost

$$\begin{aligned} \text{Standard Rate} \times \text{Standard Hours Allowed} &= \\ \$8.50 \times (180 \text{ bags} \times 2.4 \text{ hours per bag}) &= \\ \$8.50 \times 432 \text{ hours} &= \$3,672 \end{aligned}$$

Less actual cost

$$\begin{aligned} \text{Actual Rate} \times \text{Actual Hours} &= \\ \$9.20 \times 450 \text{ hours} &= \underline{4,140} \\ \text{Total direct labor cost variance} &= \underline{\underline{\$ 468}} \text{ (U)} \end{aligned}$$

Both the actual direct labor hours per bag and the actual direct labor rate varied from the standard. For effective performance evaluation, management must know how much of the total cost arose from different direct labor rates and how much from different numbers of direct labor hours. This information is found by computing the direct labor rate variance and the direct labor efficiency variance.

The **direct labor rate variance** (also called the *direct labor spending variance*) is the difference between the standard direct labor rate and the actual direct labor rate multiplied by the actual direct labor hours worked. For Cambria, it is computed as follows:

Standard rate	\$8.50
Less actual rate	<u>9.20</u>
Difference per hour	<u><u>\$0.70</u></u> (U)

$$\begin{aligned} \text{Direct Labor Rate Variance} &= (\text{Standard Rate} - \text{Actual Rate}) \times \text{Actual Hours} \\ &= \$0.70 \times 450 \text{ hours} \\ &= \underline{\underline{\$315}} \text{ (U)} \end{aligned}$$

The **direct labor efficiency variance** (also called the *direct labor quantity or usage variance*) is the difference between the standard direct labor hours allowed for good units produced and the actual direct labor hours worked multiplied by the standard direct labor rate. For Cambria, it is computed this way:

Study Note

The computation of the direct labor rate variance is very similar to the computation of the direct materials price variance. Computations of the direct labor efficiency variance and the direct materials quantity variance are also similar.

Standard hours allowed (180 bags × 2.4 hours per bag)	432 hours
Less actual hours	<u>450 hours</u>
Difference	<u>18 hours (U)</u>

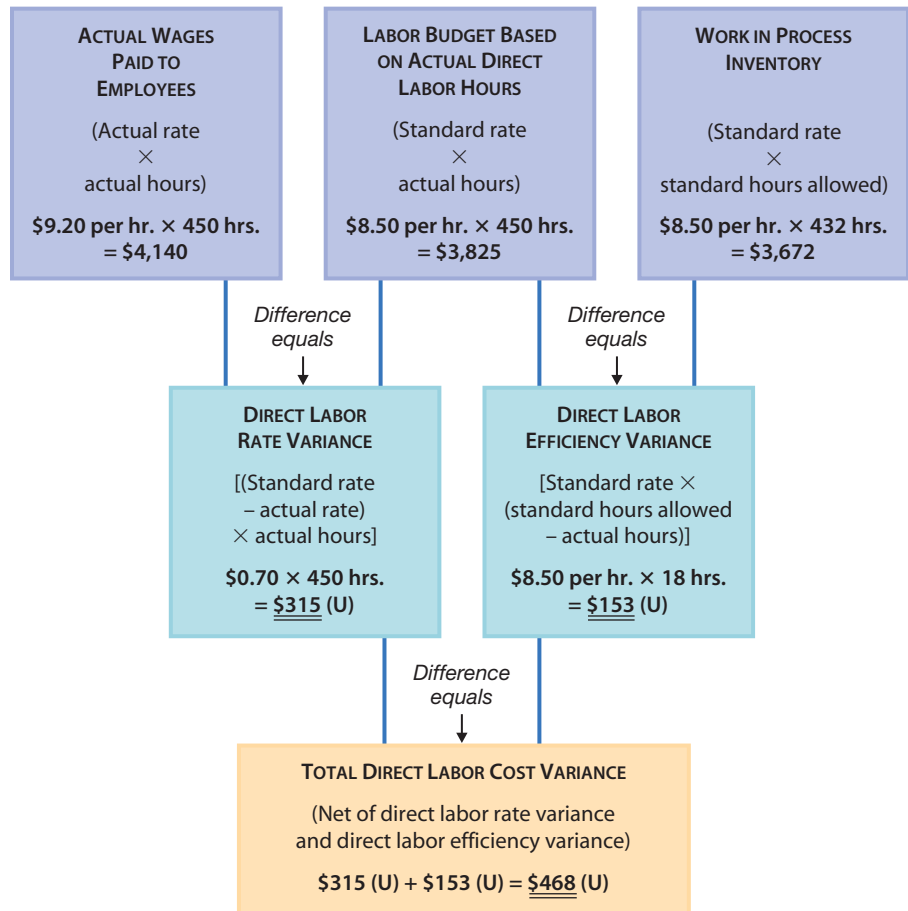
$$\begin{aligned}
 \text{Direct Labor Efficiency Variance} &= \text{Standard Rate} \times (\text{Standard Hours Allowed} - \text{Actual Hours}) \\
 &= \$8.50 \times 18 \text{ hours} \\
 &= \underline{\underline{\$153}} \text{ (U)}
 \end{aligned}$$

Summary of Direct Labor Variances If the calculations are correct, the net of the direct labor rate variance and the direct labor efficiency variance should equal the total direct labor cost variance. The following check shows that the variances were computed correctly:

Direct labor rate variance	\$315 (U)
Direct labor efficiency variance	<u>153 (U)</u>
Total direct labor cost variance	<u>\$468 (U)</u>

Figure 9-3 summarizes our analysis of Cambria Company’s direct labor variances. Unlike direct materials variances, the direct labor rate and efficiency variances are usually computed and recorded at the same time.

FIGURE 9-3
Diagram of Direct Labor
Variance Analysis





FOCUS ON BUSINESS PRACTICE

What Do You Get When You Cross a Vacuum Cleaner with a Gaming Console?

The transfer of technology ideas used for government purposes to home use is common—for example, the Internet and computers. But, what about transferring technology from home use to the battlefield? **iRobot Corporation** applied the technology it uses in its Roomba vacuum cleaner

to create small unmanned ground vehicles. These robots, such as the PackBot, have cameras that see both during the day and at night, flexible treads that allow them to climb stairs, and radio links that connect them to an operator at a gaming-like console and to the military command center.²

Analyzing and Correcting Direct Labor Variances

Because Cambria Company's direct labor rate variance and direct labor efficiency variance were unfavorable, its managers investigated the causes of these variances. An analysis of employee time cards revealed that the Bag Assembly Department had replaced an assembly worker who was ill with a machine operator from another department. The machine operator made \$9.20 per hour, whereas the assembly worker earned the standard \$8.50 per hour rate. When questioned about the unfavorable efficiency variance, the assembly supervisor identified two causes. First, the machine operator had to learn assembly skills on the job, so his assembly time was longer than the standard time per bag. Second, the materials handling people were partially responsible because they delivered parts late on five different occasions. Because the machine operator was a temporary replacement, Cambria's managers took no corrective action, but they decided to keep a close eye on the materials handling function by tracking delivery times and number of delays for the next three months. Once they have collected and analyzed the new data, they will take whatever action is needed to correct the scheduling problem.

STOP

& APPLY >

Using the following information, compare the standard cost and usage data for the production of 5-pound bags of sugar, and compute the direct labor rate and direct labor efficiency variances using formulas or diagram form:

Direct labor time standard	0.01 hour per unit
Direct labor rate standard	\$10.00 per hour
Direct labor hours used	100 hours
Total cost of direct labor	\$1,010
Number of good units produced	11,000 units

(continued)

SOLUTION

$$\begin{aligned}
 \text{Direct Labor Rate Variance} &= (\text{Standard Rate} - \text{Actual Rate}) \times \text{Actual Hours} \\
 &= [\$10.00 \div (\$1,010 \div 100 \text{ hours})] \times 100 \text{ hours} \\
 &= (\$10.00 - \$10.10) \times 100 \text{ hours} \\
 &= \$0.10 \times 100 \text{ hours} = \underline{\underline{\$10.00}} \text{ (U)}
 \end{aligned}$$

$$\begin{aligned}
 \text{Direct Labor Efficiency Variance} &= \text{Standard Rate} \times (\text{Standard Hours Allowed} - \text{Actual Hours}) \\
 &= \$10.00 \times [(11,000 \times 0.01 \text{ hour}) - 100 \text{ hours}] \\
 &= \$10.00 \times (110 \text{ hours} - 100 \text{ hours}) \\
 &= \$10.00 \times 10 \text{ hours} = \underline{\underline{\$100.00}} \text{ (F)}
 \end{aligned}$$

Diagram Form:

	Actual Rate × Actual Hours		Standard Rate × Actual Hours		Standard Rate × Standard Hours
Direct Labor	\$1,010 ^a	Rate Variance	\$1,000 ^b	Efficiency Variance	\$1,100 ^c
		\$10.00 (U)		\$100.00 (F)	

^a \$10.10 × 100 = \$1,010

^b \$10.00 × 100 = \$1,000

^c \$10.00 × (11,000 × 0.01 hour) = \$1,100

Computing and Analyzing Overhead Variances

L05 Compute and analyze overhead variances.

Many types of variable and fixed overhead costs may contribute to variances from standard costs. Controlling these costs is more difficult than controlling direct materials and direct labor costs because the responsibility for overhead costs is hard to assign. Fixed overhead costs may be unavoidable past costs, such as depreciation and lease expenses; they are therefore not under the control of any department manager. If variable overhead costs can be related to departments or activities, however, some control is possible.

Using a Flexible Budget to Analyze Overhead Variances

Earlier in the chapter, we described the flexible budget that the managers of ICU, Inc., use to evaluate overall performance. That budget, shown in Exhibit 9-2, is based on units of output. Cambria Company's managers also use a flexible budget, but to analyze overhead costs only. As you can see in Exhibit 9-4, Cambria's flexible budget uses direct labor hours as the expression of activity. Thus, variable costs vary with the number of direct labor hours worked. Total fixed overhead costs remain constant. The flexible budget formula in such cases is as follows:

$$\begin{aligned}
 \text{Total Budgeted Overhead Costs} &= (\text{Variable Costs per Direct Labor Hour} \\
 &\quad \times \text{Number of Direct Labor Hours}) \\
 &\quad + \text{Budgeted Fixed Overhead Costs}
 \end{aligned}$$

EXHIBIT 9-4

Flexible Budget for Evaluation of Overhead Costs

Cambria Company				
Flexible Budget—Overhead				
Bag Assembly Department				
For an Average One-Month Period				
Cost Category	Direct Labor Hours (DLH)			Variable Cost per DLH
	400	432	500	
Budgeted variable overhead				
Indirect materials	\$ 600	\$ 648	\$ 750	\$1.50
Indirect Labor	800	864	1,000	2.00
Supplies	300	324	375	0.75
Utilities	400	432	500	1.00
Other	200	216	250	0.50
Total budgeted variable overhead costs	<u>\$2,300</u>	<u>\$2,484</u>	<u>\$2,875</u>	<u>\$5.75</u>
Budgeted fixed overhead				
Supervisory salaries	\$ 600	\$ 600	\$ 600	
Depreciation	400	400	400	
Other	300	300	300	
Total budgeted fixed overhead costs	<u>\$1,300</u>	<u>\$1,300</u>	<u>\$1,300</u>	
Total budgeted overhead costs	<u>\$3,600</u>	<u>\$3,784</u>	<u>\$4,175</u>	
 Flexible budget formula (based on a normal capacity of 400 direct labor hours):				
Total Budgeted Overhead Costs = (Variable Costs per Direct Labor Hour				
× Number of DLH) + Budgeted Fixed				
Overhead Costs				
= (\$5.75 × Number of DLH) + \$1,300				

When applied to Cambria Company's data, the flexible budget formula is as follows:

$$\text{Total Budgeted Overhead Costs} = (\$5.75 \times \text{Number of Direct Labor Hours}) + \$1,300$$

Cambria's flexible budget shows monthly overhead costs for 400, 432, and 500 direct labor hours.

To find the total monthly flexible budgeted overhead costs for the 180 bags produced, you simply insert the direct labor hours allowed in the flexible budget formula—for example $(\$5.75 \times 432 \text{ direct labor hours}) + \$1,300 = \$3,784$.

Computing Overhead Variances

Analyses of overhead variances differ in degree of detail. The basic approach is to compute the **total overhead cost variance**, which is the difference between actual overhead costs and standard overhead costs applied. You may recall from a previous chapter how overhead was applied to production by using a standard overhead rate.

A standard overhead rate has two parts: a variable rate and a fixed rate. For Cambria Company, the standard variable rate is \$5.75 per direct labor hour (from the flexible budget). The standard fixed overhead rate is found by dividing total budgeted fixed overhead (\$1,300) by normal capacity set by the master budget at the beginning of the period. (Cambria's normal capacity is 400 direct labor hours.) The result is a fixed overhead rate of \$3.25 per direct labor hour ($\$1,300 \div 400$ hours). So, Cambria's total standard overhead rate is \$9.00 per direct labor hour ($\$5.75 + \3.25).

Cambria Company's total overhead cost variance would be computed as follows:

Standard overhead costs applied to good units produced	
$\$9.00$ per direct labor hour \times (180 bags \times 2.4 hr. per bag)	\$3,888
Less actual overhead costs	<u>4,100</u>
Total overhead cost variance	<u>\$ 212 (U)</u>

This amount can be divided into variable overhead variances and fixed overhead variances.

Variable Overhead Variances The **total variable overhead cost variance** is the difference between actual variable overhead costs and the standard variable overhead costs that are applied to good units produced using the standard variable rate. The procedure for finding this variance is similar to the procedure for finding direct materials and labor variances.

Figure 9-4 shows an analysis of Cambria Company's variable overhead variances. At Cambria, each leather bag requires 2.4 standard direct labor hours, and the standard variable overhead rate is \$5.75 per direct labor hour. For example, during August, the company incurred \$2,500 of variable overhead costs. The total variable overhead cost variance is computed as follows:

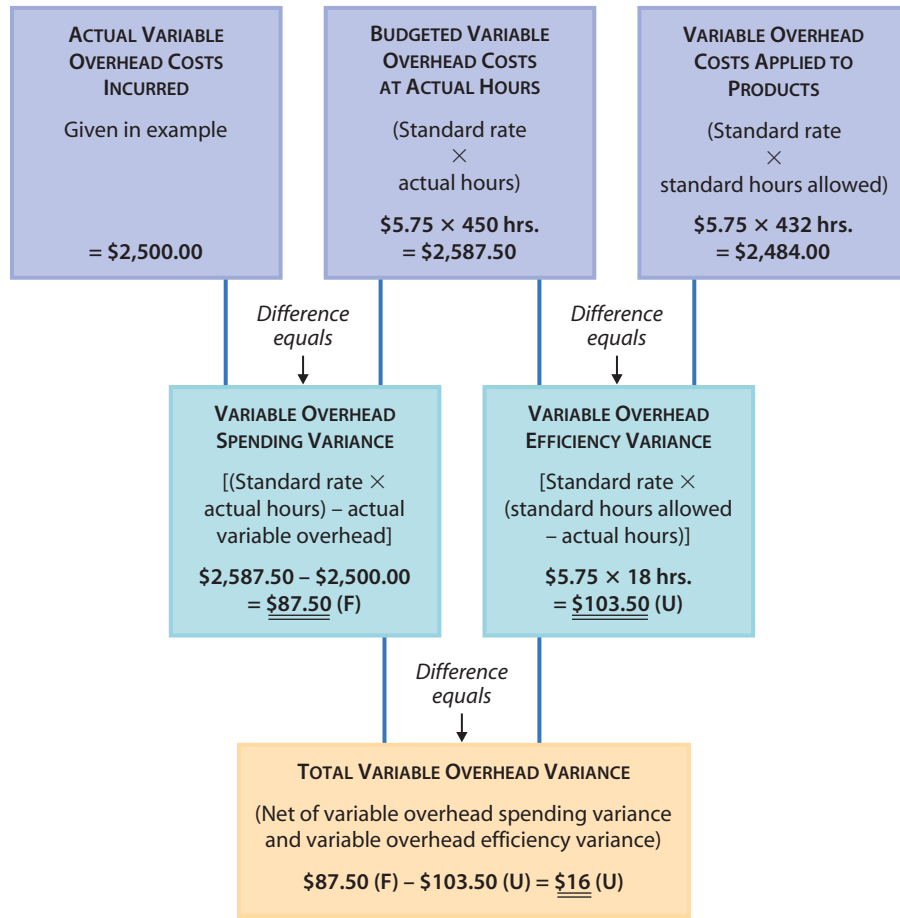
Overhead applied to good units produced	
Standard Variable Rate \times Standard Labor Hours Allowed =	
$\$5.75$ per hour \times (180 bags \times 2.4 hours per bag)	=
$\$5.75 \times 432$ hours	= \$2,484
Less actual cost	<u>2,500</u>
Total variable overhead cost variance	= <u>\$ 16 (U)</u>

Both the actual variable overhead and the direct labor hours per bag may vary from the standard. For effective performance evaluation, managers must know how much of the total cost arose from variable overhead spending deviations and how much from variable overhead application deviations (i.e., applied and actual direct labor hours). This information is found by computing the variable overhead spending variance and the variable overhead efficiency variance.

The **variable overhead spending variance** (also called the *variable overhead rate variance*) is computed by multiplying the actual hours worked by the difference between actual variable overhead costs and the standard variable overhead rate. For Cambria, it is computed as follows:

$$\begin{aligned}
 \text{Variable Overhead Spending Variance} &= (\text{Standard Variable Rate} \times \text{Actual} \\
 &\quad \text{Hours Worked}) - \text{Actual Variable} \\
 &\quad \text{Overhead Cost} \\
 &= (\$5.75 \times 450 \text{ hours}) - \$2,500.00 \\
 &= \$2,587.50 - \$2,500.00 \\
 &= \$87.50 \text{ (F)}
 \end{aligned}$$

FIGURE 9-4
Diagram of Variable Overhead
Variance Analysis



The **variable overhead efficiency variance** is the difference between the standard direct labor hours allowed for good units produced and the actual hours worked multiplied by the standard variable overhead rate per hour. For Cambria, it is computed as follows:

Standard direct labor hours allowed (180 bags × 2.4 hours per bag)	432 hours
Less actual hours	<u>450 hours</u>
Difference	<u><u>18 hours (U)</u></u>

$$\begin{aligned} \text{Variable Overhead Efficiency Variance} &= \text{Standard Variable Rate} \times (\text{Standard Hours Allowed} - \text{Actual Hours}) \\ &= \$5.75 \times 18 \text{ hours} \\ &= \underline{\underline{\$103.50 (U)}} \end{aligned}$$

Summary of Variable Overhead Variances If the calculations are correct, the net of the variable overhead spending variance and the variable overhead efficiency variance should equal the total variable overhead variance. The following check shows that these variances have been computed correctly:

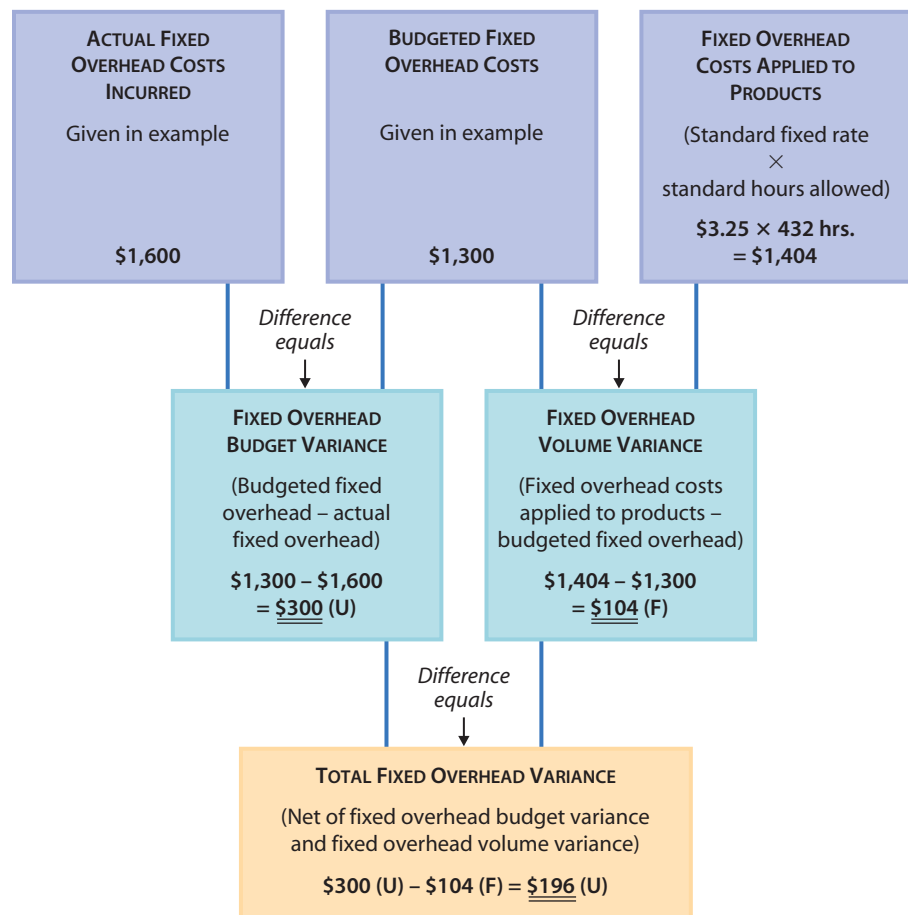
Variable overhead spending variance	\$ 87.50 (F)
Variable overhead efficiency variance	<u>103.50 (U)</u>
Total variable overhead cost variance	<u><u>\$ 16.00 (U)</u></u>

Fixed Overhead Variances The **total fixed overhead cost variance** is the difference between actual fixed overhead costs and the standard fixed overhead costs that are applied to good units produced using the standard fixed overhead rate. The procedure for finding this variance differs from the procedure used for finding direct materials, direct labor, and variable overhead variances.

Figure 9-5 shows an analysis of fixed overhead variances for Cambria Company. At Cambria, each bag requires 2.4 standard direct labor hours, and the standard fixed overhead rate is \$3.25 per direct labor hour. As we noted earlier, the standard fixed overhead rate is found by dividing budgeted fixed overhead (\$1,300) by normal capacity, which was set by the master budget at the beginning of the period. In this case, because normal capacity is 400 direct labor hours, the fixed overhead rate is \$3.25 per direct labor hour ($\$1,300 \div 400$ hours). For example, during August, Cambria incurred \$1,600 of actual fixed overhead costs. The total fixed overhead variance is computed as follows:

	Overhead applied to the good units produced
	Standard fixed rate \times Standard direct labor hours allowed =
	$\$3.25 \times (180 \text{ bags} \times 2.4 \text{ hours per bag}) =$
	$\$3.25 \times 432 \text{ hours} = \$1,404$
	Less actual cost <u>1,600</u>
	Total fixed overhead cost variance <u>= \$ 196 (U)</u>

FIGURE 9-5
Diagram of Fixed Overhead
Variance Analysis



For effective performance evaluation, managers break down the total fixed overhead cost variance into two additional variances: the fixed overhead budget variance and the fixed overhead volume variance.

The **fixed overhead budget variance** (also called the *budgeted fixed overhead variance*) is the difference between budgeted and actual fixed overhead costs. For Cambria, it is computed as follows:

$$\begin{aligned}\text{Fixed Overhead Budget Variance} &= \text{Budgeted Fixed Overhead} - \\ &\quad \text{Actual Fixed Overhead} \\ &= \$1,300 - \$1,600 \\ &= \$300 \text{ (U)}\end{aligned}$$

The **fixed overhead volume variance** is the difference between budgeted fixed overhead costs and the overhead costs that are applied to production using the standard fixed overhead rate. For Cambria, the fixed overhead volume variance is computed as follows:

Standard fixed overhead applied to good units produced	
\$3.25 per direct labor hour × (180 bags × 2.4 hours per bag)	\$1,404
Less total budgeted fixed overhead	<u>1,300</u>
Fixed overhead volume variance	<u>\$ 104 (F)</u>

Because the fixed overhead volume variance measures the use of existing facilities and capacity, a volume variance will occur if more or less than normal capacity is used. At Cambria Company, 400 direct labor hours are considered normal use of facilities. Because fixed overhead costs are applied on the basis of standard hours allowed, Cambria Company's overhead was applied on the basis of 432 hours, even though the fixed overhead rate was computed using 400 hours. Thus, more fixed costs would be applied to products than were budgeted.

- ▶ When capacity exceeds the expected amount, the result is a favorable overhead volume variance because fixed overhead was overapplied.
- ▶ When a company operates at a level below the normal capacity in units, the result is an unfavorable volume variance. Not all of the fixed overhead costs will be applied to units produced. In other words, fixed overhead is underapplied, and the cost of goods produced does not include the full budgeted cost of fixed overhead.

Summary of Variable and Fixed Overhead Variances If our calculations of variable and fixed overhead variances are correct, the net of these variances should equal the total overhead cost variance. Checking the computations, we find that the variable and fixed overhead variances do equal the total overhead cost variance:

Variable overhead spending variance	\$ 87.50 (F)
Variable overhead efficiency variance	103.50 (U)
Fixed overhead budget variance	300.00 (U)
Fixed overhead volume variance	<u>104.00 (F)</u>
Total overhead cost variance	<u>\$212.00 (U)</u>

Figures 9-4 and 9-5 summarize our analysis of overhead variances. The total overhead cost variance is also the amount of overapplied or underapplied overhead. You may recall from an earlier chapter that actual variable and fixed overhead costs are recorded as they occur, that variable and fixed overhead are applied to products as they are produced, and that the overapplied or

underapplied overhead is computed and reconciled at the end of each accounting period. By breaking down the total overhead cost variance into variable and fixed variances, managers can more accurately control costs and reconcile their causes. An analysis of these two overhead variances will help explain why the amount of overhead applied to units produced is different from the actual overhead costs incurred.

Analyzing and Correcting Overhead Variances

In analyzing the unfavorable total overhead cost variance of \$212, the manager of Cambria Company's Bag Assembly Department found causes for the variances that contributed to it:

- ▶ Although the variable overhead spending variance was favorable (\$87.50 less than expected because of savings on purchases), the inefficiency of the machine operator who substituted for an assembly worker created unfavorable variances for both direct labor efficiency and variable overhead efficiency. As a result, the manager is going to consider the feasibility of implementing a program for cross-training employees.
- ▶ After reviewing the fixed overhead costs, the manager of the Bag Assembly Department concluded that higher-than-anticipated factory insurance premiums were the reason for the unfavorable fixed overhead budget variance and were the result of an increase in the number of insurance claims filed by employees. To obtain more specific information, the manager will study the insurance claims filed over a three-month period.
- ▶ Finally, since the 432 standard hours were well above the normal capacity of 400 direct labor hours, fixed overhead was overapplied, and it resulted in a \$104(F) volume variance. The overutilization of capacity was traced to high demand that pressed the company to use almost all its capacity. Management decided not to do anything about the fixed overhead volume variance because it fell within an anticipated seasonal range.

STOP & APPLY >

Sutherland Products uses standard costing. The following information about overhead was generated during August:

Standard variable overhead rate	\$2 per machine hour
Standard fixed overhead rate	\$3 per machine hour
Actual variable overhead costs	\$443,200
Actual fixed overhead costs	\$698,800
Budgeted fixed overhead costs	\$700,000
Standard machine hours per unit produced	12
Good units produced	18,940
Actual machine hours	228,400

Compute the variable overhead spending and efficiency variances and the fixed overhead budget and volume variances using formulas or diagram form.

(continued)

SOLUTION

Variable overhead spending variance:

Budgeted variable overhead for actual hours		\$456,800
Standard rate \times actual hours worked ($\$2 \times 228,400$)		<u>443,200</u>
Less actual variable overhead costs incurred		<u>\$ 13,600 (F)</u>

Variable overhead efficiency variance:

Variable overhead applied to good units produced		\$454,560
Standard rate \times standard hours allowed [$\$2 \times (18,940 \times 12)$]		<u>456,800</u>
Less budgeted variable overhead costs for actual hours		<u>\$ 2,240 (U)</u>

Diagram Form:

	Actual Variable Overhead Costs		Standard Rate \times Actual Hours		Standard Rate \times Standard Hours
Variable Overhead	\$443,200	Spending Variance	\$456,800 ^a	Efficiency Variance	\$454,560 ^b
		\$13,600 (F)		\$2,240 (U)	

^a $\$2 \times 228,400 = \$456,800$ ^b $\$2 \times (18,940 \times 12) = \$454,560$

Fixed overhead budget variance:

Budgeted fixed overhead		\$700,000
Less actual fixed overhead costs incurred		<u>698,800</u>
Fixed overhead budget variance		<u>\$ 1,200 (F)</u>

Fixed overhead volume variance:

Fixed overhead applied to good units produced		\$681,840
Standard rate \times standard hours allowed [$\$3 \times (18,940 \times 12)$]		<u>700,000</u>
Less budgeted fixed overhead		<u>\$ 18,160 (U)</u>

Diagram Form:

	Actual Fixed Overhead Costs		Budgeted Fixed Overhead Costs		Standard Rate \times Standard Hours
Fixed Overhead	\$698,800	Budget Variance	\$700,000	Volume Variance	\$681,840 ^a
		\$1,200 (F)		\$18,160 (U)	

^a $\$3 \times (18,940 \times 12) = \$681,840$

Using Cost Variances to Evaluate Managers' Performance

LO6 Explain how variances are used to evaluate managers' performance.

How effectively and fairly a manager's performance is evaluated depends on human factors—the people doing the evaluating—as well as on company policies. The evaluation process becomes more accurate when managerial performance reports include variances from standard costs.

To ensure that the evaluation of a manager's performance is effective and fair, a company's policies should be based on input from managers and employees and should specify the procedures that managers are to use when doing the following:

- ▶ Preparing operational plans
- ▶ Assigning responsibility for carrying out the operational plans
- ▶ Communicating the operational plans to key personnel
- ▶ Evaluating performance in each area of responsibility
- ▶ Identifying the causes of significant variances from the operational plan
- ▶ Taking corrective action to eliminate problems

Because variance analysis provides detailed data about differences between standard and actual costs and thus helps identify the causes of those differences, it is usually more effective at pinpointing efficient and inefficient operating areas than are basic comparisons of budgeted and actual data. A managerial performance report based on standard costs and related variances should identify the causes of each significant variance, the personnel involved, and the corrective actions taken. It should be tailored to the cost center manager's specific areas of responsibility and explain clearly how the manager's department met or did not meet operating expectations. Managers should be held accountable only for the cost areas under their control.

Exhibit 9-5 shows a performance report for the manager of Cambria Company's Bag Assembly Department. The report summarizes all cost data and variances for direct materials, direct labor, and overhead. In addition, it identifies the causes of the variances and the corrective actions taken. Such a report would enable a supervisor to review a cost center manager's actions and evaluate his or her performance.

A point to remember is that the mere occurrence of a variance does not indicate that a manager of a cost center has performed poorly. However, if a variance occurs consistently, and no cause is identified and no corrective action is taken, it may well indicate poor managerial performance.

Exhibit 9-5 shows that the causes of the variances have been identified and corrective actions have been taken, indicating that the manager of the Cambria Company's Bag Assembly Department has the operation under control.

EXHIBIT 9-5 Managerial Performance Report Using Variance Analysis

Cambria Company
Managerial Performance Report
Bag Assembly Department
For the Month Ended August 31

Productivity Summary:

Normal capacity in units	167 bags
Normal capacity in direct labor hours (DLH)	400 DLH*
Good units produced	180 bags
Performance level (standard hours allowed for good units produced)	432 DLH

*Rounded.

Cost and Variance Analysis:

	Standard Costs	Actual Costs	Total Variance	Variance Breakdown	
				Amount	Type
Direct materials	\$ 4,320	\$ 4,484	\$164 (U)	\$ 76.00 (F)	Direct materials price variance
				240.00 (U)	Direct materials quantity variance
Direct labor	3,672	4,140	468 (U)	315.00 (U)	Direct labor rate variance
				153.00 (U)	Direct labor efficiency variance
Variable overhead	2,484	2,500	16 (U)	87.50 (F)	Variable overhead spending variance
				103.50 (U)	Variable overhead efficiency variance
Fixed overhead	1,404	1,600	196 (U)	300.00 (U)	Fixed overhead budget variance
				104.00 (F)	Fixed overhead volume variance
Totals	<u>\$11,880</u>	<u>\$12,724</u>	<u>\$844 (U)</u>	<u>\$844.00 (U)</u>	

Causes of Variances**Actions Taken****Direct materials price variance:**

New direct materials purchased at reduced price

New direct materials deemed inappropriate; resumed purchasing materials originally specified

Direct materials quantity variance:

Poor quality of new direct materials

New direct materials deemed inappropriate; resumed using direct materials originally specified

Direct labor rate variance:

Machine operator who had to learn assembly skills

Temporary replacement; no action taken on the job

Direct labor efficiency variance:

Machine operator who had to learn assembly skills

Temporary replacement; no action taken on the job

Late delivery of parts to assembly floor

Material delivery times and number of delays being tracked

Variable overhead spending variance:

Cost savings on purchases

No action necessary

Variable overhead efficiency variance:

Machine operator who had to learn assembly skills on the job

A cross-training program for employees now under consideration

Fixed overhead budget variance:

Large number of factory insurance claims

Study of insurance claims being conducted

Fixed overhead volume variance:

High number of orders caused by demand

No action necessary

STOP & APPLY >

Jason Ponds, the production manager at WAWA Industries, recently received his performance report from Gina Rolando, the company's controller. The report contained the following information:

	Actual Cost	Standard Cost	Variance
Direct materials	\$38,200	\$36,600	\$1,600 (U)
Direct labor	19,450	19,000	450 (U)
Variable overhead	62,890	60,000	2,890 (U)

Rolando asked Ponds to respond to his performance report. If you were Ponds, how would you respond? What additional information might you need to prepare your response?

SOLUTION

Ponds is responsible only for the direct materials quantity variance, the direct labor efficiency variance, and the variable overhead efficiency variance. Before he answers the controller's query, he needs to break down the total variances given to him into their individual variance amounts. Then, and only then, will he know how well or poorly he performed.

A LOOK BACK AT ► iROBOT CORPORATION

The Decision Point at the beginning of this chapter focused on **iRobot Corporation**, a manufacturer of robots for military, industrial, and home use. It asked these questions:

- How does setting performance standards help managers control costs?
- How do managers use standard costs to evaluate the performance of cost centers?

Managers base standard costs on realistic estimates of operating costs. They use these figures as performance targets and as benchmarks against which they measure actual spending trends. By analyzing variances between standard and actual costs, they gain insight into the causes of those differences. Once they have identified an operating problem that is causing a cost variance, they can devise a solution that results in better control of costs.

When evaluating the performance of cost centers, managers use standard costs to prepare a flexible budget, which will improve the accuracy of their variance analysis. This comparison of actual costs and a budget based on the same amount of output can provide managers with objective data that they can use to assess the center's performance in terms of its key success factor—cost.

**Review Problem****Variance Analysis**

L01 L03
L04 L05

Suppose a company makes a heavy-duty plastic bag for a 30-pound aerial robot. The bag is made in a single cost center using a standard costing system. The standard variable costs for one bag (a unit) are as follows:

Direct materials (3 sq. meters @ \$12.50 per sq. meter)	\$37.50
Direct labor (1.2 hours @ \$9.00 per hour)	10.80
Variable overhead (1.2 hours @ \$5.00 per direct labor hour)	<u>6.00</u>
Standard variable cost per unit	<u>\$54.30</u>

The company's master budget was based on its normal capacity of 15,000 direct labor hours. Its budgeted fixed overhead costs for the year were \$54,000. During the year, the company produced and sold 12,200 bags, and it purchased and used 37,500

square meters of direct materials; the purchase cost was \$12.40 per square meter. The average labor rate was \$9.20 per hour, and 15,250 direct labor hours were worked. The company actual variable overhead costs for the year were \$73,200, and its fixed overhead costs were \$55,000.

Required

Using the data given, compute the following using formulas or diagram form:

1. Standard hours allowed for good output
2. Standard fixed overhead rate
3. Direct materials cost variances:
 - a. Direct materials price variance
 - b. Direct materials quantity variance
 - c. Total direct materials cost variance
4. Direct labor cost variances:
 - a. Direct labor rate variance
 - b. Direct labor efficiency variance
 - c. Total direct labor cost variance
5. Variable overhead cost variances:
 - a. Variable overhead spending variance
 - b. Variable overhead efficiency variance
 - c. Total variable overhead cost variance
6. Fixed overhead cost variances:
 - a. Fixed overhead budget variance
 - b. Fixed overhead volume variance
 - c. Total fixed overhead cost variance

**Answers to
Review Problem**

1. Standard Hours Allowed = Good Units Produced \times Standard Direct Labor Hours per Unit
 $= 12,200 \text{ Units} \times 1.2 \text{ Direct Labor Hours per Unit}$
 $= \underline{14,640 \text{ Hours}}$
2. Standard Fixed Overhead Rate = $\frac{\text{Budgeted Fixed Overhead Cost}}{\text{Normal Capacity}}$
 $= \frac{\$54,000}{15,000 \text{ Direct Labor Hours}}$
 $= \underline{\underline{\$3.60 \text{ per Direct Labor Hour}}}$
3. Direct Materials Cost Variances:
 - a. Direct Materials Price Variance:

Price difference: Standard price	\$12.50
Less actual price	12.40
Difference	<u>\$ 0.10 (F)</u>

 Direct Materials Price Variance = (Standard Price – Actual Price)
 \times Actual Quantity
 $= \$0.10 \times 37,500 \text{ Sq. Meters}$
 $= \underline{\underline{\$3,750 (F)}}$

b. Direct Materials Quantity Variance:

Quantity difference: Standard quantity	(12,200 units × 3 sq. meters)	36,600 Sq. Meters
Less actual quantity		<u>37,500 Sq. Meters</u>
Difference		<u>900 Sq. Meters (U)</u>

$$\begin{aligned}
 \text{Direct Materials Quantity Variance} &= \text{Standard Price} \times (\text{Standard Quantity} - \text{Actual Quantity}) \\
 &= \$12.50 \text{ per Sq. Meter} \times 900 \text{ Sq. Meters} \\
 &= \underline{\underline{\$11,250 (U)}}
 \end{aligned}$$

c. Total Direct Materials Cost Variance:

$$\begin{aligned}
 \text{Total Direct Materials Cost Variance} &= \text{Net of Direct Materials Price Variance and Direct Materials Quantity Variance} \\
 &= \$3,750 (F) - \$11,250 (U) \\
 &= \underline{\underline{\$7,500 (U)}}
 \end{aligned}$$

Diagram Form:

	Actual Price × Actual Quantity		Standard Price × Actual Quantity		Standard Price × Standard Quantity
Direct Materials	\$12.40 × 37,500 = \$465,000	Price Variance	\$12.50 × 37,500 = \$468,750	Quantity Variance	\$12.50 × (12,200 × 3) = \$457,500
		\$3,750 (F)	Total Direct Materials Cost Variance	\$11,250 (U)	
			\$7,500 (U)		

4. Direct Labor Cost Variances:

a. Direct Labor Rate Variance:

Rate difference: Standard labor rate	\$9.00
Less actual labor rate	<u>9.20</u>
Difference	<u>\$0.20 (U)</u>

$$\begin{aligned}
 \text{Direct Labor Rate Variance} &= (\text{Standard Rate} - \text{Actual Rate}) \\
 &\quad \times \text{Actual Hours} \\
 &= \$0.20 \times 15,250 \text{ hours} \\
 &= \underline{\underline{\$3,050 (U)}}
 \end{aligned}$$

b. Direct Labor Efficiency Variance:

Difference in hours: Standard hours allowed	14,640 hours*
Less actual hours	<u>15,250 hours</u>
Difference	<u>610 hours (U)</u>

$$\begin{aligned}
 \text{Direct Labor Efficiency Variance} &= \text{Standard Rate} \times (\text{Standard Hours Allowed} - \text{Actual Hours}) \\
 &= \$9.00 \text{ per hour} \times 610 \text{ hours (U)} \\
 &= \underline{\underline{\$5,490 (U)}}
 \end{aligned}$$

*12,200 units produced × 1.2 hours per unit = 14,640 hours.

- c. Total Direct Labor Cost Variance:
 Total Direct Labor Cost Variance = Net of Direct Labor Rate
 Variance and Direct
 Labor Efficiency Variance
 = \$3,050 (U) + \$5,490 (U)
 = \$8,540 (U)

Diagram Form:

	Actual Rate × Actual Hours		Standard Rate × Actual Hours		Standard Rate × Standard Hours
Direct Labor	\$9.20 × 15,250 = \$140,300	Rate Variance	\$9.00 × 15,250 = \$137,250	Efficiency Variance	\$9.00 × (12,200 × 1.2) = \$131,760
		\$3,050 (U)	Total Direct Labor Cost Variance	\$5,490 (U)	
			\$8,540 (U)		

5. Variable Overhead Cost Variances:
- a. Variable Overhead Spending Variance:
 Standard variable rate × actual hours worked
 (\$5.00 per hour × 15,250 labor hours) \$76,250
 Less actual variable overhead costs incurred 73,200
 Variable Overhead Spending Variance \$ 3,050 (F)
- b. Variable Overhead Efficiency Variance:
 Variable overhead applied to good units produced
 (14,640 hours* × \$5.00 per hour) \$73,200
 Less budgeted variable overhead for actual hours
 (15,250 hours × \$5.00 per hour) 76,250
 Variable Overhead Efficiency Variance \$ 3,050 (U)

*12,200 units produced × 1.2 hours per unit = 14,640 hours.

- c. Total Variable Overhead Cost Variance:
 Total Variable Overhead Cost Variance = Net of Variable Overhead
 Spending Variance and
 Variable Overhead Efficiency
 Variance
 = \$3,050 (F) – \$3,050 (U)
 = \$0

Diagram Form:

	Actual Variable Overhead Costs		Standard Rate × Actual Hours		Standard Rate × Standard Hours
Variable Overhead	\$73,200	Spending Variance	\$5.00 × 15,250 = \$76,250	Efficiency Variance	\$5.00 × (12,200 × 1.2) = \$73,200
		\$3,050 (F)	Total Variable Overhead Cost Variance	\$3,050 (U)	
			\$0		

6. Fixed Overhead Cost Variances:
- a. Fixed Overhead Budget Variance:

Budgeted fixed overhead	\$54,000
Less actual fixed overhead	<u>55,000</u>
Fixed Overhead Budget Variance	<u>\$ 1,000 (U)</u>

 - b. Fixed Overhead Volume Variance:

Standard fixed overhead applied (14,640 labor hours × \$3.60* per hour)	\$52,704
Less total budgeted fixed overhead	<u>54,000</u>
Fixed Overhead Volume Variance	<u>\$ 1,296 (U)</u>

 - c. Total Fixed Overhead Cost Variance:

Total Fixed Overhead Cost Variance = Net of Fixed Overhead Budget Variance and Fixed Overhead Volume Variance	
= \$1,000 (U) + \$1,296 (U)	
= <u>\$2,296 (U)</u>	

*From answer to requirement 2.

Diagram Form:

	Actual Fixed Overhead Costs		Budgeted Fixed Overhead Costs		Standard Rate × Standard Hours
Fixed Overhead	\$55,000	Budget Variance	\$54,000	Volume Variance	$\$3.60 \times (12,200 \times 1.2) = \$52,704$
		\$1,000 (U)	Total Fixed Overhead Cost Variance	\$1,296 (U)	
			\$2,296 (U)		

STOP & REVIEW >

- LO1 Define *standard costs*, explain how standard costs are developed, and compute a standard unit cost.** Standard costs are realistic estimates of costs based on analyses of both past and projected operating costs and conditions. They provide a standard, or predetermined, performance level for use in standard costing, a method of cost control that also includes a measure of actual performance and a measure of the variance between standard and actual performance.
- A standard unit cost has six elements. A total standard unit cost is computed by adding the following costs: direct materials costs (direct materials price standard times direct materials quantity standard), direct labor costs (direct labor rate standard times direct labor time standard), and overhead costs (standard variable and standard fixed overhead rate times standard direct labor hours allowed per unit).
- LO2 Prepare a flexible budget, and describe how managers use variance analysis to control costs.** A flexible budget is a summary of anticipated costs for a range of activity levels. It provides forecasted cost data that can be adjusted for changes in level of output. The variable cost per unit and total fixed costs presented in a flexible budget are components of the flexible budget formula, an equation that determines the budgeted cost for any level of output. A flexible budget improves the accuracy of variance analysis, which is a four-step approach to controlling costs. First, managers compute the amount of the variance. If the amount is significant, managers then analyze the variance to identify its cause. They then select performance measures that will enable them to track those activities, analyze the results, and determine the action needed to correct the problem. Their final step is to take the appropriate corrective action.
- LO3 Compute and analyze direct materials variances.** The direct materials price variance is computed by finding the difference between the standard price and the actual price per unit and multiplying it by the actual quantity purchased. The direct materials quantity variance is the difference between the standard quantity that should have been used and the actual quantity used, multiplied by the standard price. An analysis of these variances enables managers to identify what is causing them and to formulate plans for correcting related operating problems.
- LO4 Compute and analyze direct labor variances.** The direct labor rate variance is computed by determining the difference between the standard direct labor rate and the actual rate and multiplying it by the actual direct labor hours worked. The direct labor efficiency variance is the difference between the standard hours allowed for the number of good units produced and the actual hours worked multiplied by the standard direct labor rate. Managers analyze these variances to find the causes of differences between standard direct labor costs and actual direct labor costs.
- LO5 Compute and analyze overhead variances.** The total overhead variance is equal to the amount of under- or overapplied overhead costs for an accounting period. An analysis of the variable and fixed overhead variances will help explain why the amount of overhead applied to units produced differs from the actual overhead costs incurred. The total overhead cost variance can be broken down into a variable overhead spending variance, a variable overhead efficiency variance, a fixed overhead budget variance, and a fixed overhead volume variance.

LO6 Explain how variances are used to evaluate managers' performance.

How effectively and fairly a manager's performance is evaluated depends on human factors—the people doing the evaluating—as well as on company policies. To ensure that performance evaluation is effective and fair, a company's evaluation policies should be based on input from managers and employees and should be specific about the procedures that managers are to follow. The evaluation process becomes more accurate when managerial performance reports for cost centers include variances from standard costs. A managerial performance report based on standard costs and related variances should identify the causes of each significant variance, along with the personnel involved and the corrective actions taken. It should be tailored to the cost center manager's specific areas of responsibility.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Direct labor efficiency variance 358 (LO4)	Fixed overhead budget variance 366 (LO5)	Total direct labor cost variance 358 (LO4)
Direct labor rate standard 348 (LO1)	Fixed overhead volume variance 366 (LO5)	Total direct materials cost variance 355 (LO3)
Direct labor rate variance 358 (LO4)	Flexible budget 350 (LO2)	Total fixed overhead cost variance 365 (LO5)
Direct labor time standard 348 (LO1)	Flexible budget formula 351 (LO2)	Total overhead cost variance 362 (LO5)
Direct materials price standard 347 (LO1)	Standard costing 346 (LO1)	Total variable overhead cost variance 363 (LO5)
Direct materials price variance 355 (LO3)	Standard costs 346 (LO1)	Variable overhead efficiency variance 364 (LO5)
Direct materials quantity standard 347 (LO1)	Standard direct labor cost 347 (LO1)	Variable overhead spending variance 363 (LO5)
Direct materials quantity variance 355 (LO3)	Standard direct materials cost 347 (LO1)	Variance 346 (LO1)
	Standard fixed overhead rate 348 (LO1)	Variance analysis 350 (LO2)
	Standard overhead cost 348 (LO1)	
	Standard variable overhead rate 348 (LO1)	

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Uses of Standard Costs

SE 1. Lago Corporation is considering adopting the standard costing method. Dan Sarkis, the manager of the Ohio Division, attended a corporate meeting at which Leah Rohr, the controller, discussed the proposal. Sarkis asked, “Leah, how will this new method benefit me? How will I use it?” Prepare Rohr’s response to Sarkis.

L01 Purposes of Standard Costs

SE 2. Suppose you are a management consultant and a client asks you why companies include standard costs in their cost accounting systems. Prepare your response, listing several purposes for using standard costs.

L01 Computing a Standard Unit Cost

SE 3. Using the information that follows, compute the standard unit cost of Product MZW:

Direct materials quantity standard	5 pounds per unit
Direct materials price standard	\$10.20 per pound
Direct labor time standard	0.2 hour per unit
Direct labor rate standard	\$10.75 per hour
Variable overhead rate standard	\$7.00 per machine hour
Fixed overhead rate standard	\$11.00 per machine hour
Machine hour standard	3 hours per unit

L02 Analyzing Cost Variances

SE 4. Garden Metal Works produces lawn sculptures. The company analyzes only variances that differ by more than 5 percent from the standard cost. The controller computed the following direct labor efficiency variances for March:

	Direct Labor Efficiency Variance	Standard Direct Labor Cost
Product 4	\$1,240 (U)	\$26,200
Product 6	3,290 (F)	41,700
Product 7	2,030 (U)	34,300
Product 9	1,620 (F)	32,560
Product 12	2,810 (U)	59,740

For each product, determine the variance as a percentage of the standard cost (round to one decimal place). Then identify the products whose variances should be analyzed and suggest possible causes for the variances.

L02 Preparing a Flexible Budget

SE 5. Prepare a flexible budget for 10,000, 12,000, and 14,000 units of output, using the following information:

Variable costs	
Direct materials	\$10.00 per unit
Direct labor	\$3.00 per unit
Variable overhead	\$5.00 per unit
Total budgeted fixed overhead	\$80,800

L03 Direct Materials Variances

SE 6. Using the standard unit costs that you computed in **SE 3** and the following actual cost and usage data, compute the direct materials price and direct materials quantity variances:

Direct materials purchased and used (pounds)	55,000
Price paid for direct materials	\$10.00 per pound
Number of good units produced	11,000 units

L04 Direct Labor Variances

SE 7. Using the standard unit costs that you computed in **SE 3** and the following actual cost and usage data, compute the direct labor rate and direct labor efficiency variances:

Direct labor hours used	2,250 hours
Total cost of direct labor	\$24,750
Number of good units produced	11,000 units

L05 Overhead Variances

SE 8. Weatherall Products uses standard costing. The following information about overhead was generated during August:

Standard variable overhead rate	\$3.00 per machine hour
Standard fixed overhead rate	\$3.10 per machine hour
Actual variable overhead costs	\$680,100
Actual fixed overhead costs	\$698,800
Budgeted fixed overhead costs	\$700,000
Standard machine hours per unit produced	12
Good units produced	18,940
Actual machine hours	228,400

Compute the variable overhead spending and efficiency variances and the fixed overhead budget and volume variances.

L05 Fixed Overhead Rate and Variances

SE 9. To the Point Manufacturing Company uses the standard costing method. The company's main product is a fine-quality fountain pen that normally takes 2.5 hours to produce. Normal annual capacity is 30,000 direct labor hours, and budgeted fixed overhead costs for the year were \$15,000. During the year, the company produced and sold 14,000 units. Actual fixed overhead costs were \$19,000. Compute the fixed overhead rate per direct labor hour, and determine the fixed overhead budget and volume variances.

L06 Evaluating Managerial Performance

SE 10. Raul Tempest, the controller at GoTo Products, gave Jim Dodds, the production manager, a report containing the following information:

	Actual Cost	Standard Cost	Variance
Direct materials	\$40,200	\$38,200	\$2,000 (U)
Direct labor	17,550	17,000	550 (U)
Variable overhead	52,860	50,000	2,860 (U)

Tempest asked for a response. If you were Dodds, how would you respond? What additional information might you need to prepare your response?

Exercises

L01 Uses of Standard Costs

E 1. Summer Diaz has just assumed the duties of controller for Market Research Company. She is concerned that the company's methods of cost planning and control do not accurately track the operations of the business. She plans to suggest to the company's president, Sydney Tyson, that the company start using standard costing for budgeting and cost control. The new method could be incorporated into the existing accounting system. The anticipated cost of adopting it and training managers is around \$7,500. Prepare a memo from Summer Diaz to Sydney Tyson that defines standard costing and outlines its uses and benefits.

L01 Computing Standard Costs

E 2. Normal Corporation uses standard costing and is in the process of updating its direct materials and direct labor standards for Product 20B. The following data have been accumulated:

Direct materials In the previous period, 20,500 units were produced, and 32,800 square yards of direct materials at a cost of \$122,344 were used to produce them.

Direct labor During the previous period, 57,400 direct labor hours were worked—34,850 hours on machine H and 22,550 hours on machine K. Machine H operators earned \$9.40 per hour, and machine K operators earned \$9.20 per hour last period. A new labor union contract calls for a 10 percent increase in labor rates for the coming period.

Using this information as the basis for the new standards, compute the direct materials quantity and price standards and the direct labor time and rate standards for each machine for the coming accounting period.

L01 Computing a Standard Unit Cost

E 3. Weather Aerodynamics, Inc., makes electronically equipped weather-detecting balloons for university meteorology departments. Because of recent nationwide inflation, the company's management has ordered that standard costs be recomputed. New direct materials price standards are \$700 per set for electronic components and \$14.00 per square meter for heavy-duty canvas. Direct materials quantity standards include one set of electronic components and 100 square meters of heavy-duty canvas per balloon. Direct labor time standards are 26 hours per balloon for the Electronics Department and 21 hours per balloon for the Assembly Department. Direct labor rate standards are \$21 per hour for the Electronics Department and \$18 per hour for the Assembly Department. Standard overhead rates are \$16 per direct labor hour for the standard variable overhead rate and \$12 per direct labor hour for the standard fixed overhead rate. Using these production standards, compute the standard unit cost of one weather balloon.

L02 Preparing a Flexible Budget

E 4. Keel Company's fixed overhead costs for the year are expected to be as follows: depreciation, \$80,000; supervisory salaries, \$92,000; property taxes and insurance, \$26,000; and other fixed overhead, \$14,500. Total fixed overhead is thus expected to be \$212,500. Variable costs per unit are expected to be as follows: direct materials, \$17.00; direct labor, \$9.00; operating supplies, \$3.00; indirect labor, \$4.00; and other variable overhead costs, \$2.50. Prepare a flexible budget for the following levels of production: 15,000 units, 20,000 units, and 25,000 units. What is the flexible budget formula for the year ended December 31?

L03 Direct Materials Price and Quantity Variances

E 5. SITO Elevator Company manufactures small hydroelectric elevators with a maximum capacity of ten passengers. One of the direct materials used is heavy-duty carpeting for the floor of the elevator. The direct materials quantity standard for April was 8 square yards per elevator. During April, the purchasing agent purchased this carpeting at \$11 per square yard; the standard price for the period was \$12. Ninety elevators were completed and sold during the month; the Production Department used an average of 8.5 square yards of carpet per elevator. Calculate the company's direct materials price and quantity variances for carpeting for April.

L03 Direct Materials Variances

E 6. Diekow Productions manufactured and sold 1,000 products at \$11,000 each during the past year. At the beginning of the year, production had been set at 1,200 products; direct materials standards had been set at 100 pounds of direct materials at \$2 per pound for each product produced. During the year, the company purchased and used 98,000 pounds of direct materials; the cost was \$2.04 per pound. Calculate Diekow Production's direct materials price and quantity variances for the year.

L04 Direct Labor Variances

E 7. At the beginning of last year, Diekow Productions set direct labor standards of 20 hours at \$15 per hour for each product produced. During the year, 20,500 direct labor hours were actually worked at an average cost of \$16 per hour. Using this information and the applicable information in **E 6**, calculate Diekow Production's direct labor rate and efficiency variances for the year.

L04 Direct Labor Rate and Efficiency Variances

E 8. NEO Foundry, Inc., manufactures castings that other companies use in the production of machinery. For the past two years, NEO's best-selling product has been a casting for an eight-cylinder engine block. Standard direct labor hours per engine block are 1.8 hours. A labor union contract requires that the company pay all direct labor employees \$14 per hour. During June, NEO produced 16,500 engine blocks. Actual direct labor hours and costs for the month were 29,900 hours and \$433,550, respectively.

1. Compute the direct labor rate variance for eight-cylinder engine blocks during June.
2. Using the same data, compute the direct labor efficiency variance for eight-cylinder engine blocks during June. Check your answer, assuming that the total direct labor cost variance is \$17,750 (U).

L05 Variable Overhead Variances

E 9. At the beginning of last year, Diekow Productions set variable overhead standards of 10 machine hours at a rate of \$10 per hour for each product produced. During the year, 10,800 machine hours were used at a cost of \$10.20 per hour. Using this information and the applicable information in **E 6**, calculate Diekow Production's variable overhead spending and efficiency variances for the year.

L05 Fixed Overhead Variances

E 10. At the beginning of last year, Diekow Productions set budgeted fixed overhead costs at \$456,000. During the year, actual fixed overhead costs were \$500,000. Using this information and the applicable information in **E 6**, calculate Diekow Production's fixed overhead budget and volume variances for the year. Assume that fixed overhead is applied based on units of product.

L05 Variable Overhead Variances for a Service Business

E 11. Design Architects, LLP, billed clients for 6,000 hours of design work for the month. Actual variable overhead costs for the month were \$315,000, and 6,250 hours were worked. At the beginning of the year, a variable overhead standard of \$50 per design hour had been developed based on a budget of 5,000 design hours each month. Calculate Design Architects' variable overhead spending and efficiency variances for the month.

L05 Fixed Overhead Variances for a Service Business

E 12. Engineering Associates billed clients for 11,000 hours of engineering work for the month. Actual fixed overhead costs for the month were \$435,000, and 11,850 hours were worked. At the beginning of the year, a fixed overhead standard of \$40 per engineering hour had been developed based on a budget of 10,000 engineering hours each month. Calculate Engineering Associates' fixed overhead budget and volume variances for the month.

L05 Overhead Variances

E 13. Cedar Key Company produces handmade clamming buckets and sells them to distributors along the Gulf Coast of Florida. The company incurred \$9,400 of actual overhead costs (\$8,000 variable; \$1,400 fixed) in May. Budgeted standard overhead costs for May were \$4 of variable overhead costs per direct labor hour and \$1,500 of fixed overhead costs. Normal capacity was set at 2,000 direct labor hours per month. In May, the company produced 10,100 clamming buckets by working 1,900 direct labor hours. The time standard is 0.2 direct labor hour per clamming bucket. Compute (1) the variable overhead spending and efficiency variances and (2) the fixed overhead budget and volume variances for May.

L05 Overhead Variances

E 14. Suncoast Industries uses standard costing and a flexible budget for cost planning and control. Its monthly budget for overhead costs is \$200,000 of fixed costs plus \$5.20 per machine hour. Monthly normal capacity of 100,000 machine hours is used to compute the standard fixed overhead rate. During December, employees worked 105,000 machine hours. Only 98,500 standard machine hours were allowed for good units produced during the month. Actual overhead costs incurred during December totaled \$441,000 of variable costs and \$204,500 of fixed costs. Compute (1) the under- or overapplied overhead during December and (2) the variable overhead spending and efficiency variances and the fixed overhead budget and volume variances.

L06 Evaluating Managerial Performance

E 15. Ron LaTulip oversees projects for ACE Construction Company. Recently, the company's controller sent him a performance report regarding the construction of the Campus Highlands Apartment Complex, a project that LaTulip supervised. Included in the report was an unfavorable direct labor efficiency variance of \$1,900 for roof structures. What types of information does LaTulip need to analyze before he can respond to this report?

Problems

L01 Computing and Using Standard Costs

P 1. Prefabricated houses are the specialty of Affordable Homes, Inc., of Corsicana, Texas. Although Affordable Homes produces many models, the company's

best-selling model is the Welcome Home, a three-bedroom, 1,400-square-foot house with an impressive front entrance. Last year, the standard costs for the six basic direct materials used in manufacturing the entrance were as follows: wood framing materials, \$2,140; deluxe front door, \$480; door hardware, \$260; exterior siding, \$710; electrical materials, \$580; and interior finishing materials, \$1,520. Three types of direct labor are used to build the entrance: carpenter, 30 hours at \$12 per hour; door specialist, 4 hours at \$14 per hour; and electrician, 8 hours at \$16 per hour. Last year, the company used an overhead rate of 40 percent of total direct materials cost.

This year, the cost of wood framing materials is expected to increase by 20 percent, and a deluxe front door will cost \$496. The cost of the door hardware will increase by 10 percent, and the cost of electrical materials will increase by 20 percent. Exterior siding cost should decrease by \$16 per unit. The cost of interior finishing materials is expected to remain the same. The carpenter's wages will increase by \$1 per hour, and the door specialist's wages should remain the same. The electrician's wages will increase by \$0.50 per hour. Finally, the overhead rate will decrease to 25 percent of total direct materials cost.

Required

1. Compute the total standard cost of direct materials per entrance for last year.
2. Using your answer to requirement 1, compute the total standard unit cost per entrance for last year.
3. Compute the total standard unit cost per entrance for this year.

LO2 Preparing a Flexible Budget and Evaluating Performance

P 2. Home Products Company manufactures a complete line of kitchen glassware. The Beverage Division specializes in 12-ounce drinking glasses. Erin Fisher, the superintendent of the Beverage Division, asked the controller to prepare a report of her division's performance in April. The following report was handed to her a few days later:

Cost Category (Variable Unit Cost)	Budgeted Costs*	Actual Costs	Difference Under (Over) Budget
Direct materials (\$0.10)	\$ 5,000	\$ 4,975	\$ 25
Direct labor (\$0.12)	6,000	5,850	150
Variable overhead			
Indirect labor (\$0.03)	1,500	1,290	210
Supplies (\$0.02)	1,000	960	40
Heat and power (\$0.03)	1,500	1,325	175
Other (\$0.05)	2,500	2,340	160
Fixed overhead			
Heat and power	3,500	3,500	—
Depreciation	4,200	4,200	—
Insurance and taxes	1,200	1,200	—
Other	1,600	1,600	—
Totals	<u>\$28,000</u>	<u>\$27,240</u>	<u>\$760</u>

*Based on normal capacity of 50,000 units.

In discussing the report with the controller, Fisher stated, "Profits have been decreasing in recent months, but this report indicates that our production process is operating efficiently."

Required

1. Prepare a flexible budget for the Beverage Division using production levels of 45,000 units, 50,000 units, and 55,000 units.
 2. What is the flexible budget formula?
 3. Assume that the Beverage Division produced 46,560 units in April and that all fixed costs remained constant. Prepare a revised performance report similar to the one above, using actual production in units as a basis for the budget column.
- Manager insight** ▶ 4. Which report is more meaningful for performance evaluation, the original one above or the revised one? Why?

L03 L04 Direct Materials and Direct Labor Variances

P 3. Winners Trophy Company produces a variety of athletic awards, most of them in the form of trophies. Its deluxe trophy stands 3 feet tall above the base. The company's direct materials standards for the deluxe trophy include 1 pound of metal and 8 ounces of wood for the base. Standard prices for the year were \$3.30 per pound of metal and \$0.45 per ounce of wood. Direct labor standards for the deluxe trophy specify 0.2 hour of direct labor in the Molding Department and 0.4 hour in the Trimming/Finishing Department. Standard direct labor rates are \$10.75 per hour in the Molding Department and \$12.00 per hour in the Trimming/Finishing Department.

During January, the company made 16,400 deluxe trophies. Actual production data are as follows:

Direct materials	
Metal	16,640 pounds @ \$3.25 per pound
Wood	131,400 ounces @ \$0.48 per ounce
Direct labor	
Molding	3,400 hours @ \$10.60 per hour
Trimming/Finishing	6,540 hours @ \$12.10 per hour

Required

1. Compute the direct materials price and quantity variances for metal and wood.
2. Compute the direct labor rate and efficiency variances for the Molding and the Trimming/Finishing Departments.

L03 L04 L05 Direct Materials, Direct Labor, and Overhead Variances

P 4. The Doormat Division of Clean Sweep Company produces all-vinyl mats. Each doormat calls for 0.4 meter of vinyl material; the material should cost \$3.10 per meter. Standard direct labor hours and labor cost per doormat are 0.2 hour and \$1.84 (0.2 hour \times \$9.20 per hour), respectively. Currently, the division's standard variable overhead rate is \$1.50 per direct labor hour, and its standard fixed overhead rate is \$0.80 per direct labor hour.

In August, the division manufactured and sold 60,000 doormats. During the month, it used 25,200 meters of vinyl material; the total cost of the material was \$73,080. The total actual overhead costs for August were \$28,200, of which \$18,200 was variable. The total number of direct labor hours worked was 10,800, and the factory payroll for direct labor for the month was \$95,040. Budgeted fixed overhead for August was \$9,280. Normal monthly capacity for the year was set at 58,000 doormats.

Required

1. Compute for August the (a) direct materials price variance, (b) direct materials quantity variance, (c) direct labor rate variance, (d) direct labor efficiency

variance, (e) variable overhead spending variance, (f) variable overhead efficiency variance, (g) fixed overhead budget variance, and (h) fixed overhead volume variance.

Manager insight ▶

2. Prepare a performance report based on your variance analysis, and suggest possible causes for each variance.

L05 Overhead Variances

P 5. Celine Corporation's accountant left for vacation before completing the monthly cost variance report. George Celine, the corporation's president, has asked you to complete the report. The following data are available to you (capacities are expressed in machine hours):

Actual machine hours	17,100
Standard machine hours allowed	17,500
Actual variable overhead	a
Standard variable overhead rate	\$2.50
Variable overhead spending variance	\$250 (F)
Variable overhead efficiency variance	b
Actual fixed overhead	c
Budgeted fixed overhead	\$153,000
Fixed overhead budget variance	\$1,300 (U)
Fixed overhead volume variance	\$4,500 (F)
Normal capacity in machine hours	d
Standard fixed overhead rate	e
Fixed overhead applied	f

Required

Analyze the data and fill in the missing amounts. (**Hint:** Use the structure of Figures 23-4 and 23-5 to guide your analysis.)

Alternate Problems

L01 Computing Standard Costs for Direct Materials

P 6. TickTock, Ltd., assembles clock movements for grandfather clocks. Each movement has four components: the clock facing, the clock hands, the time movement, and the spring assembly. For the current year, the company used the following standard costs: clock facing, \$15.90; clock hands, \$12.70; time movement, \$66.10; and spring assembly, \$52.50.

Prices of materials are expected to change next year. TickTock will purchase 60 percent of the facings from Company A at \$18.50 each and the other 40 percent from Company B at \$18.80 each. The clock hands, which are produced for TickTock by Hardware, Inc., will cost \$15.50 per set next year. TickTock will purchase 30 percent of the time movements from Company Q at \$68.50 each, 20 percent from Company R at \$69.50 each, and 50 percent from Company S at \$71.90 each. The manufacturer that supplies TickTock with spring assemblies has announced that it will increase its prices by 20 percent.

Required

1. Determine the total standard direct materials cost per unit for next year.
2. Suppose that because TickTock has guaranteed Hardware, Inc., that it will purchase 2,500 sets of clock hands next year, the cost of a set of clock hands has been reduced by 20 percent. Find the standard direct materials cost per clock.

- Manager insight** ▶ 3. Suppose that to avoid the increase in the cost of spring assemblies, TickTock purchased substandard ones from a different manufacturer at \$50 each; 20 percent of them turned out to be unusable and could not be returned. Assuming that all other data remain the same, compute the standard direct materials unit cost. Spread the cost of the defective materials over the good units produced.

L02 Flexible Budgets and Performance Evaluation

P 7. Cassen Realtors, Inc., specializes in the sale of residential properties. It earns its revenue by charging a percentage of the sales price. Commissions for sales persons, listing agents, and listing companies are its main costs. Business has improved steadily over the last 10 years. Bonnie Cassen, the managing partner of Cassen Realtors, receives a report summarizing the company's performance each year. The report for the most recent year appears below.

Cassen Realtors, Inc.			
Performance Report			
For the Year Ended December 31			
	Budgeted*	Actual†	Difference Under (Over) Budget
Total selling fees	\$2,052,000	\$2,242,200	(\$190,200)
Variable costs			
Sales commissions	\$1,102,950	\$1,205,183	(\$102,233)
Automobile	36,000	39,560	(3,560)
Advertising	93,600	103,450	(9,850)
Home repairs	77,400	89,240	(11,840)
General overhead	656,100	716,970	(60,870)
	<u>\$1,966,050</u>	<u>\$2,154,403</u>	<u>(\$188,353)</u>
Fixed costs			
General overhead	60,000	62,300	(2,300)
Total costs	<u>\$2,026,050</u>	<u>\$2,216,703</u>	<u>(\$190,653)</u>
Operating income	<u>\$ 25,950</u>	<u>\$ 25,497</u>	<u>\$ 453</u>

*Budgeted data are based on 180 units sold.

†Actual data for 200 units sold.

Required

- Analyze the performance report. What does it say about the company's performance? Is the performance report reliable? Explain your answer.
 - Calculate the budgeted selling fee and budgeted variable costs per home sale.
 - Prepare a performance report using a flexible budget based on the actual number of home sales.
 - Analyze the report you prepared in requirement 3. What does it say about the company's performance? Is the report reliable? Explain your answer.
 - What recommendations would you make to improve the company's performance next year?
- Manager insight** ▶
- Manager insight** ▶

L03 L04 Direct Materials and Direct Labor Variances

P 8. Fruit Packaging Company makes plastic baskets for food wholesalers. Each basket requires 0.8 gram of liquid plastic and 0.6 gram of an additive that includes color and hardening agents. The standard prices are \$0.15 per gram of liquid plastic and \$0.09 per gram of additive. Two kinds of direct labor—molding and

trimming/packing—are required to make the baskets. The direct labor time and rate standards for a batch of 100 baskets are as follows: molding, 1.0 hour per batch at an hourly rate of \$12; and trimming/packing, 1.2 hours per batch at \$10 per hour.

During the year, the company produced 48,000 baskets. It used 38,600 grams of liquid plastic at a total cost of \$5,404 and 28,950 grams of additive at \$2,895. Actual direct labor included 480 hours for molding at a total cost of \$5,664 and 560 hours for trimming/packing at \$5,656.

Required

1. Compute the direct materials price and quantity variances for both the liquid plastic and the additive.
2. Compute the direct labor rate and efficiency variances for the molding and trimming/packing processes.

L03 L04 Computing Variances and Evaluating Performance

L05 L06 P 9. Last year, Biomed Laboratories, Inc., researched and perfected a cure for the common cold. Called Cold-Gone, the product sells for \$28.00 per package, each of which contains five tablets. Standard unit costs for this product were developed late last year for use this year. Per package, the standard unit costs were as follows: chemical ingredients, 6 ounces at \$1.00 per ounce; packaging, \$1.20; direct labor, 0.8 hour at \$14.00 per hour; standard variable overhead, \$4.00 per direct labor hour; and standard fixed overhead, \$6.40 per direct labor hour. Normal capacity is 46,875 units per week.

In the first quarter of this year, demand for the new product rose well beyond the expectations of management. During those three months, the peak season for colds, the company produced and sold over 500,000 packages of Cold-Gone. During the first week in April, it produced 50,000 packages but used materials for 50,200 packages costing \$60,240. It also used 305,000 ounces of chemical ingredients costing \$292,800. The total cost of direct labor for the week was \$579,600; direct labor hours totaled 40,250. Total variable overhead was \$161,100, and total fixed overhead was \$242,000. Budgeted fixed overhead for the week was \$240,000.

Required

1. Compute for the first week of April (a) all direct materials price variances, (b) all direct materials quantity variances, (c) the direct labor rate variance, (d) the direct labor efficiency variance, (e) the variable overhead spending variance, (f) the variable overhead efficiency variance, (g) the fixed overhead budget variance, and (h) the fixed overhead volume variance.
2. Prepare a performance report based on your variance analysis, and suggest possible causes for each significant variance.

Manager insight ►

L05 Overhead Variances

P 10. Meantime Corporation's accountant left for vacation before completing the monthly cost variance report. Gillian Thornton, the corporation's president, has asked you to complete the report. The following data are available to you:

Actual machine hours	20,100
Standard machine hours allowed	20,500
Actual variable overhead	a
Standard variable overhead rate	\$2.00
Variable overhead spending variance	\$200 (F)
Variable overhead efficiency variance	b
Actual fixed overhead	c

Budgeted fixed overhead	\$153,000
Fixed overhead budget variance	\$500 (U)
Fixed overhead volume variance	\$750 (F)
Normal capacity in machine hours	d
Standard fixed overhead rate	e
Fixed overhead applied	f

Required

Analyze the data and fill in the missing amounts. (**Hint:** Use the structure of Figures 23-4 and 23-5 to guide your analysis.)

ENHANCING Your Knowledge, Skills, and Critical Thinking

L01 An Ethical Question Involving Standard Costs

C 1. Taylor Industries, Inc., develops standard costs for all its direct materials, direct labor, and overhead costs. It uses these costs to price products, cost inventories, and evaluate the performance of purchasing and production managers. It updates the standard costs whenever costs, prices, or rates change by 3 percent or more. It also reviews and updates all standard costs each December; this practice provides current standards that are appropriate for use in valuing year-end inventories on the company's financial statements.

Jody Elgar is in charge of standard costing at Taylor Industries. On November 30, she received a memo from the chief financial officer informing her that Taylor Industries was considering purchasing another company and that she and her staff were to postpone adjusting standard costs until late February; they were instead to concentrate on analyzing the proposed purchase.

In the third week of November, prices on more than 20 of Taylor Industries' direct materials had been reduced by 10 percent or more, and a new labor union contract had reduced several categories of labor rates. A revision of standard costs in December would have resulted in lower valuations of inventories, higher cost of goods sold because of inventory write-downs, and lower net income for the year. Elgar believed that the company was facing an operating loss and that the assignment to evaluate the proposed purchase was designed primarily to keep her staff from revising and lowering standard costs. She questioned the chief financial officer about the assignment and reiterated the need for updating the standard costs, but she was again told to ignore the update and concentrate on the proposed purchase. Elgar and her staff were relieved of the evaluation assignment in early February. The purchase never materialized.

Assess Jody Elgar's actions in this situation. Did she follow all ethical paths to solving the problem? What are the consequences of failing to adjust the standard costs?

L01 L02 Standard Costs and Variance Analysis

C 2. Domino's Pizza is a major purveyor of home-delivered pizzas. Although customers can pick up their orders at the shops where Domino's makes its pizzas, employees deliver most orders to customers' homes, and they use their own cars to do it.

Specify what standard costing for a Domino's pizza shop would entail. Where would you obtain the information for determining the cost standards? In what ways would the standards help in managing a pizza shop? If necessary to gain a better understanding of the operation, visit a pizzeria. (It does not have to be a Domino's.)

Your instructor will divide the class into groups to discuss the case. Summarize your group's discussion, and select one person from your group to report the group's findings to the class.

L02 L04 Preparing Performance Reports

L05 L06 C 3. Troy Corrente, the president of Forest Valley Spa, is concerned about the spa's operating performance during March. He budgeted his costs carefully so that he could reduce the annual membership fees. He now needs to evaluate those costs to make sure that the spa's profits are at the level he expected.

He has asked you, the spa's controller, to prepare a performance report on labor and overhead costs for March. He also wants you to analyze the report and suggest possible causes for any problems that you find. He wants to attend to any problems quickly, so he has asked you to submit your report as soon as possible. The following information for the month is available to you:

	Budgeted Costs	Actual Costs
Variable costs		
Operating labor	\$10,880	\$12,150
Utilities	2,880	3,360
Repairs and maintenance	5,760	7,140
Fixed overhead costs		
Depreciation, equipment	2,600	2,680
Rent	3,280	3,280
Other	1,704	1,860
Totals	<u>\$27,104</u>	<u>\$30,470</u>

Corrente's budget allows for eight employees to work 160 hours each per month. During March, nine employees worked an average of 150 hours each.

- Answer the following questions:
 - Why are you preparing this performance report?
 - Who will use the report?
 - What information do you need to develop the report? How will you obtain that information?
 - When are the performance report and the analysis needed?
- With the limited information available to you, compute the labor rate variance, the labor efficiency variance, and the variable and fixed overhead variances.
- Prepare a performance report for the spa for March. Analyze the report, and suggest causes for any problems that you find.

L02 L05 Developing a Flexible Budget and Analyzing Overhead Variances

C 4. Ezelda Marva is the controller at FH Industries. She has asked you, her new assistant, to analyze the following data related to projected and actual overhead costs for October:

	Standard Variable Costs per Machine Hour (MH)	Actual Variable Costs in October
Indirect materials and supplies	\$1.10	\$ 2,380
Indirect machine setup labor	2.50	5,090
Materials handling	1.40	3,950
Maintenance and repairs	1.50	2,980
Utilities	0.80	1,490
Miscellaneous	0.10	200
Totals	<u>\$7.40</u>	<u>\$16,090</u>

(continued)

	Budgeted Fixed Overhead	Actual Fixed Overhead in October
Supervisory salaries	\$ 3,630	\$ 3,630
Machine depreciation	8,360	8,580
Other	1,210	1,220
Totals	<u>\$13,200</u>	<u>\$13,430</u>

For October, the number of good units produced was used to compute the 2,100 standard machine hours allowed.

1. Prepare a monthly flexible budget for operating activity at 2,000 machine hours, 2,200 machine hours, and 2,500 machine hours.
2. Develop a flexible budget formula.
3. The company's normal operating capacity is 2,200 machine hours per month. Compute the fixed overhead rate at this level of activity. Then break the rate down into rates for each element of fixed overhead.
4. Prepare a detailed comparative cost analysis for October. Include all variable and fixed overhead costs. Format your analysis by using columns for the following five elements: cost category, cost per machine hour, costs applied, actual costs incurred, and variance.
5. Develop an overhead variance analysis for October that identifies the variable overhead spending and efficiency variances and the fixed overhead budget and volume variances.
6. Prepare an analysis of the variances. Could a manager control some of the fixed costs? Defend your answer.

L04 L05 Standard Costing in a Service Company

C 5. Annuity Life Insurance Company (ALIC) markets several types of life insurance policies, but P20A—a permanent, 20-year life annuity policy—is its most popular. This policy sells in \$10,000 increments and features variable percentages of whole life insurance and single-payment annuities, depending on the policyholder's needs and age. ALIC devotes an entire department to supporting and marketing the P20A policy. Because both the support staff and the sales persons contribute to each P20A policy, ALIC categorizes them as direct labor for purposes of variance analysis, cost control, and performance evaluation. For unit costing, each \$10,000 increment is considered one unit; thus, a \$90,000 policy is counted as nine units. Standard unit cost information for January is as follows:

Direct labor	
Policy support staff	
3 hours at \$12.00 per hour	\$ 36.00
Policy sales person	
8.5 hours at \$14.20 per hour	120.70
Operating overhead	
Variable operating overhead	
11.5 hours at \$26.00 per hour	299.00
Fixed operating overhead	
11.5 hours at \$18.00 per hour	<u>207.00</u>
Standard unit cost	<u>\$662.70</u>

Actual costs incurred for the 265 units sold during January were as follows:

Direct labor		
Policy support staff		
848 hours at \$12.50 per hour		\$10,600
Policy sales persons		
2,252.5 hours at \$14.00 per hour		31,535
Operating overhead		
Variable operating overhead		78,440
Fixed operating overhead		53,400

Normal monthly capacity is 260 units, and the budgeted fixed operating overhead for January was \$53,820.

1. Compute the standard hours allowed in January for policy support staff and policy sales persons.
2. What should the total standard costs for January have been? What were the total actual costs that the company incurred in January? Compute the total cost variance for the month.
3. Compute the direct labor rate and efficiency variances for policy support staff and policy sales persons.
4. Compute the variable and fixed operating overhead variances for January.
5. Identify possible causes for each variance and suggest possible solutions.

L03 L04 Cookie Company (Continuing Case)

L06

C 6. In this segment of our continuing case, assume that you have been using standard costing to plan and control costs at your cookie store. In a meeting with your budget team, which includes managers and employees from the Purchasing, Product Design, and Production departments, you ask all team members to describe any operating problems they encountered in the last quarter. You explain that you will use this information to analyze the causes of significant cost variances that occurred during the quarter.

For each of the following situations, identify the direct materials and/or direct labor variance(s) that could be affected, and indicate whether the variances are favorable or unfavorable:

1. The production department uses highly skilled, highly paid workers.
2. Machines were improperly adjusted.
3. Direct labor personnel worked more carefully than they had in the past to manufacture the product.
4. The Product Design Department replaced a direct material with one that was less expensive and of lower quality.
5. The Purchasing Department bought higher-quality materials at a higher price.
6. A major supplier used a less-expensive mode of transportation to deliver the raw materials.
7. Work was halted for 2 hours because of a power failure.

CHAPTER

10

Short-Run Decision Analysis

The Management Process

PLAN

- ▷ Discover a problem or a need.
- ▷ Identify all reasonable courses of action that can solve the problem or meet the need.
- ▷ Prepare a thorough analysis of each possible solution, identifying its total costs, savings, and other financial effects, as well as any qualitative effects.
- ▷ Select the best course of action.

PERFORM

- ▷ Make decisions that affect operations in the current period, including outsourcing, special order, segment profitability, sales mix, and sell or process-further decisions.

EVALUATE

- ▷ Examine each short-run decision and how it affected the organization.
- ▷ Identify and prescribe corrective action.

COMMUNICATE

- ▷ Prepare reports related to short-run decisions throughout the year.

Managers use incremental analysis to make a variety of operating decisions throughout the year.

Managers use both financial and nonfinancial quantitative information to analyze the effects of past and potential business actions on their organization's resources and profits. Although many short-term business problems are unique and cannot be solved by following strict rules, managers often take predictable actions when making decisions that will affect their organizations in the short run. In this chapter, we describe those actions. We also explain how managers use incremental analysis in making various types of short-term decisions.

LEARNING OBJECTIVES

- L01** Describe how managers make short-run decisions using incremental analysis. (pp. 394–397)
- L02** Perform incremental analysis for outsourcing decisions. (pp. 397–399)
- L03** Perform incremental analysis for special order decisions. (pp. 399–401)
- L04** Perform incremental analysis for segment profitability decisions. (pp. 402–404)
- L05** Perform incremental analysis for sales mix decisions involving constrained resources. (pp. 404–407)
- L06** Perform incremental analysis for sell or process-further decisions. (pp. 407–409)

DECISION POINT ► A MANAGER'S FOCUS BANK OF AMERICA

Bank of America is one of the world's largest financial institutions. It serves large corporations, small and mid-sized businesses, governments, institutions, and individuals in over 150 countries. In the United States alone, it serves approximately 53 million individuals and small businesses. The bank has received numerous awards for online customer satisfaction and for its initiatives in preventing online fraud and identity theft. In 2009, more than 29 million of its customers did their banking online.

Managers at Bank of America believe the trend to online commerce is good for business. As customers gain confidence in dealing with their finances over the Internet, the bank's managers plan to offer more online products and services. In their quest to find safe and innovative ways to meet the needs of customers, managers at Bank of America make short-run decisions that affect the bank's profits, resources, and opportunities to increase online banking.

- How do managers at Bank of America decide on new ways to increase business and protect customers' interests?
- How can incremental analysis help managers at Bank of America take advantage of the business opportunities that online banking offers?



Short-Run Decision Analysis and the Management Process

LO1 Describe how managers make short-run decisions using incremental analysis.

Many of the decisions that managers make affect their organization's activities in the short run. Those decisions are the focus of this chapter. In making short-run decisions, managers need historical and estimated quantitative information that is both financial and nonfinancial in nature. Such information should be relevant, timely, and presented in a format that is easy to use in decision making.

Short-run decision analysis is the systematic examination of any decision whose effects will be felt over the course of the next year. The decision analysis must take into account the organization's strategic plan and tactical objectives, the related costs and revenues, as well as any relevant qualitative factors.

Although many business problems are unique and cannot be solved by following strict rules, managers frequently take four predictable actions when making short-run decisions:

1. Discover a problem or need.
2. Identify all reasonable courses of action that can solve the problem or meet the need.
3. Prepare a thorough analysis of each possible solution, identifying its total costs, savings, and other financial effects, as well as any qualitative factors.
4. Select the best course of action.

Later, managers review each decision to determine whether it produced the forecasted results by examining how it was carried out and how it affected the organization. If results fell short, they identify and prescribe corrective action. This postdecision audit supplies feedback about the results of the short-run decision. If the solution is not completely satisfactory or if the problem remains, the management process begins again.

In the course of a year, managers may make many short-run decisions, such as whether to make a product or service or buy it from an outside supplier, whether to accept a special order, whether to keep or drop an unprofitable segment, and whether to sell a product as is or process it further. If resources are limited, they may also have to decide on the most appropriate product mix. In making such decisions, managers analyze not only quantitative factors relating to profitability and liquidity; they also analyze qualitative factors. For example, the qualitative factors a bank might consider when deciding whether to keep or eliminate a branch location include the following:

- ▶ Competition (Do our competitors have a branch office located here?)
- ▶ Economic conditions (Is the community growing?)
- ▶ Social issues (Will keeping this branch benefit the community we serve?)
- ▶ Product or service quality (Can we attract more business because of the quality of service at this branch?)
- ▶ Timeliness (Does the branch promote customer service?)

Managers must identify and assess the importance of all such qualitative factors, as well as quantitative factors, when they make short-run decisions.

Incremental Analysis for Short-Run Decisions

Once managers have determined that a problem or need is worthy of consideration and have identified alternative courses of action, they must evaluate the effect that each alternative will have on their organization. The method of



FOCUS ON BUSINESS PRACTICE

How Much Does It Cost to Process a Check?

Banks today have several options for processing checks. They can outsource the processing of paper checks, use the quasi-paperless system of ATMs, or process transactions over the Internet. Bank managers have found that online banking substantially reduces transaction processing costs.

According to a study by an international consulting firm, the cost of processing a transaction is 1 cent if the transaction is completed over the Internet, 27 cents if an ATM is used, and \$1.07 if processed by a teller.¹

Study Note

Incremental analysis is a technique used not only by businesses but also by individuals to solve daily problems.

comparing alternatives by focusing on the differences in their projected revenues and costs is called **incremental analysis**. If incremental analysis excludes revenues or costs that stay the same or that do not change between the alternatives, it is called *differential analysis*.

Irrelevant Costs and Revenues A cost that changes between alternatives is known as a **differential cost** (also called an *incremental cost*). For example, suppose that managers at Home State Bank, a local institution, are deciding which of two ATM machines—C or W—to buy. The ATMs have the same purchase price but different revenue and cost characteristics. The company currently owns ATM B, which it bought three years ago for \$15,000 and which has accumulated depreciation of \$9,000 and a book value of \$6,000. ATM B is now obsolete as a result of advances in technology and cannot be sold or traded in.

A manager has prepared the following comparison of the annual revenue and operating cost estimates for the two new machines:

	<i>ATM C</i>	<i>ATM W</i>
Increase in revenue	\$16,200	\$19,800
Increase in annual operating costs		
Direct materials	4,800	4,800
Direct labor	2,200	4,100
Variable overhead	2,100	3,050
Fixed overhead (depreciation included)	5,000	5,000

Study Note

Sunk costs cannot be recovered and are irrelevant in short-run decision making.

The first step in the incremental analysis is to eliminate any irrelevant revenues and costs. *Irrelevant revenues* are those that will not differ between the alternatives. *Irrelevant costs* include sunk costs and costs that will not differ between the alternatives. A **sunk cost** is a cost that was incurred because of a previous decision and cannot be recovered through the current decision. An example of a sunk cost is the book value of ATM B. A manager might be tempted to say that the ATM should not be junked because the company still has \$6,000 invested in it. However, the manager would be incorrect because the book value of the old ATM represents money that was spent in the past and so does not affect the decision about whether to replace the old ATM with a new one.

The old ATM would be of interest only if it could be sold or traded in, and if the amount received for it would be different, depending on which new ATM

EXHIBIT 10-1
Incremental Analysis

Home State Bank Incremental Analysis			Difference in Favor of ATM W
	ATM C	ATM W	
Increase in revenue	\$16,200	\$19,800	\$3,600
Increase in annual operating costs that differ between alternatives			
Direct labor	\$ 2,200	\$ 4,100	(\$1,900)
Variable overhead	2,100	3,050	(950)
Total increase in operating costs	\$ 4,300	\$ 7,150	(\$2,850)
Resulting change in operating income	<u>\$11,900</u>	<u>\$12,650</u>	<u>\$ 750</u>

was chosen. In that case, the amount of the sale or trade-in value would be relevant to the decision because it would affect the future cash flows of the alternatives. Two examples of an irrelevant cost in the financial data for ATMs C and W are the costs of direct materials and fixed overhead (depreciation included). These costs can also be eliminated from the analysis because they are the same under both alternatives.

Once the irrelevant revenues and costs have been identified, the incremental analysis can be prepared using only the differential revenues and costs that will change between the alternative ATMs, as shown in Exhibit 10-1. The analysis shows that ATM W would produce \$750 more in operating income than ATM C. Because the costs of buying the two ATMs are the same, this report would favor the purchase of ATM W.

Opportunity Costs Because incremental analysis focuses on only the quantitative differences among the alternatives, it simplifies management's evaluation of a decision and reduces the time needed to choose the best course of action. However, incremental analysis is only one input to the final decision. Management needs to consider other issues. For instance, the manufacturer of ATM C might have a reputation for better quality or service than the manufacturer of ATM W. **Opportunity costs** are the benefits that are forfeited or lost when one alternative is chosen over another. For example, suppose Home State Bank offers a local plant nursery a high price for the land on which the nursery is located. The interest that could be earned from investing the cash proceeds of the land sale is an opportunity cost for the nursery owner. It is revenue that the nursery owner has chosen to forgo to continue operating the nursery in that location.

Study Note

Opportunity costs arise when the choice of one course of action eliminates the possibility of another course of action.

Opportunity costs often come into play when a company is operating at or near capacity and must choose which products or services to offer. For example, suppose that Home State Bank, which currently services 20,000 debit cards, has the option of offering 15,000 premium debit cards, which is a higher-priced product, but it cannot do both. The amount of income from the 20,000 debit cards is an opportunity cost of the premium debit cards.

STOP & APPLY >

Credit Banc has assembled the following monthly information related to the purchase of a new automated teller machine:

	Machine A	Machine B
Increase in revenue	\$4,200	\$5,100
Increase in annual operating costs		
Direct materials	1,200	1,200
Direct labor	1,200	1,600
Variable overhead	2,500	2,900
Fixed overhead (including depreciation)	1,400	1,400

Using incremental analysis and only relevant information, compute the difference in favor of the Machine B.

SOLUTION

	Credit Banc Incremental Analysis		Difference in Favor of Machine B
	Machine A	Machine B	
Increase in revenue	\$4,200	\$5,100	\$ 900
Increase in operating costs that differ between alternatives			
Direct labor	\$1,200	\$1,600	(\$ 400)
Variable overhead	2,500	2,900	(400)
Total increase in operating costs	<u>\$3,700</u>	<u>\$4,500</u>	<u>(\$ 800)</u>
Resulting change in operating income	<u>\$ 500</u>	<u>\$ 600</u>	<u>\$ 100</u>

Incremental Analysis for Outsourcing Decisions

L02 Perform incremental analysis for outsourcing decisions.

Outsourcing is the use of suppliers outside the organization to perform services or produce goods that could be performed or produced internally. **Make-or-buy decisions**, which are decisions about whether to make a part internally or buy it from an external supplier, may lead to outsourcing. However, a company may decide to outsource entire operating activities, such as warehousing or human resources, that have traditionally been performed in-house.

To improve operating income and compete effectively in global markets, many companies are focusing their resources on their core competencies—that is, the activities that they perform best. One way to obtain the financial, physical, human, and technological resources needed to emphasize those competencies is to outsource expensive nonvalue-adding activities. Strong candidates for outsourcing include payroll processing, training, managing fleets of vehicles, sales and marketing, custodial services, and information management. Many such areas involve either relatively low skill levels (such as payroll processing or custodial services) or highly specialized knowledge (such as information management) that could be better acquired from experts outside the company.

Outsourcing production or operating activities can reduce a company's investment in physical assets and human resources, which can improve cash flow. It can also help a company reduce its operating costs and improve operating income. For example, because [Amazon.com](https://www.amazon.com) outsources the distribution of most of its

products, it has been able to reduce its storage and distribution costs enough to offer product discounts of up to 40 percent off the list price. It is also able to provide additional value-adding services, such as online reviews by customers, personalized recommendations, and discussions and interviews on current products.

Outsourcing Analysis In manufacturing companies, a common decision facing managers is whether to make or to buy some or all of the parts used in product assembly. The goal is to select the more profitable choice by identifying the costs of each alternative and their effects on revenues and existing costs. Managers need the following information for this analysis:

<i>Information About Making</i>	<i>Information About Buying</i>
Variable costs of making the item	Purchase price of item
Need for additional machinery	Rent or net cash flow to be generated from vacated space in the factory
Incremental fixed costs	Salvage value of unused machinery

To illustrate a manufacturer’s outsourcing decision, let’s suppose that for the past five years, Box Company has purchased packing cartons from an outside supplier at a cost of \$1.25 per carton.

- ▶ The supplier has just informed Box Company that it is raising the price 20 percent, to \$1.50 per carton, effective immediately.
- ▶ Box Company has idle machinery that could be adjusted to produce the cartons. Annual production and usage would be 20,000 cartons. The company estimates the cost of direct materials at \$0.84 per carton. Workers, who will be paid \$8.00 per hour, can process 20 cartons per hour (\$0.40 per carton). The cost of variable overhead will be \$4 per direct labor hour, and 1,000 direct labor hours will be required.
- ▶ Fixed overhead includes \$4,000 of depreciation per year and \$6,000 of other fixed costs.
- ▶ The company has space and machinery to produce the cartons; the machines are currently idle and will continue to be idle if the cartons are purchased.

Should Box Company continue to outsource the cartons?

Exhibit 10-2 presents an incremental analysis of the two alternatives. All relevant costs are listed. Because the machinery has already been purchased and

Study Note

When performing an incremental analysis for an outsourcing decision, do not incorporate irrelevant information, such as depreciation and other fixed costs. Include only costs that change between the alternatives.

EXHIBIT 10-2
Incremental Analysis:
Outsourcing Decision

Box Company Outsourcing Decision Incremental Analysis			Difference in Favor of Make
	Make	Outsource	Favor of Make
Direct materials (20,000 × \$0.84)	\$16,800	—	(\$16,800)
Direct labor (20,000 × \$0.40)	8,000	—	(8,000)
Variable overhead (1,000 hours × \$4)	4,000	—	(4,000)
Purchase price (20,000 × \$1.50)	—	\$30,000	30,000
Totals	<u>\$28,800</u>	<u>\$30,000</u>	<u>\$ 1,200</u>

neither the machinery nor the required factory space has any other use, the depreciation costs and other fixed overhead costs are the same for both alternatives; therefore, they are not relevant to the decision. The cost of making the needed cartons is \$28,800. The cost of buying 20,000 cartons at the increased purchase price will be \$30,000. Since the company would save \$1,200 by making the cartons, management will decide to make the cartons.

STOP & APPLY >

Office Associates, Inc., is currently operating at less than capacity. The company thinks it could cut costs by outsourcing office cleaning to an independent cleaning service for \$75 a week. Currently, a general office worker is employed for \$10 an hour to do light cleaning and other general office duties. Cleaning the office usually takes one hour a day to perform and consumes \$10 of supplies, \$2 of variable overhead, and \$18 of fixed overhead each week. Should Office Associates, Inc., continue to perform office cleanings, or should it begin to outsource them?

SOLUTION

Costs per Cleaning	Continue to Perform Cleanings	Outsource Cleanings	Difference in Favor of Continuing to Perform Cleanings
Employee labor	\$50	—	(\$50)
Supplies	10	—	(10)
Variable overhead	2	—	(2)
Outside cleaning service	—	\$75	75
Totals	<u>\$62</u>	<u>\$75</u>	<u>\$13</u>

Office Associates should continue to perform office cleanings itself.

Incremental Analysis for Special Order Decisions

LO3 Perform incremental analysis for special order decisions.

Study Note

A decision to accept a special order assumes that excess capacity exists to fulfill the order and that the order will not have an impact on regular sales orders.

Managers are often faced with **special order decisions**, which are decisions about whether to accept or reject special orders at prices below the normal market prices. Special orders usually involve large numbers of similar products that are sold in bulk. Before a firm accepts a special product order, it must be sure that excess capacity exists to complete the order and that the order will not reduce unit sales from its full-priced regular product line.

The objective of a special order decision is to determine whether a special order should be accepted. A special order should be accepted only if it maximizes operating income. In many situations, sales commission expenses are excluded from a special order decision analysis because the customer approached the company directly. In addition, the fixed costs of existing facilities usually do not change if a company accepts a special order, and therefore these costs are usually irrelevant to the decision. If additional fixed costs must be incurred to fill the special order, they would be relevant to the decision. Examples of relevant fixed costs are the purchase of additional machinery, an increase in supervisory help, and an increase in insurance premiums required by a specific order.

Special Order Analyses One approach to a special order decision is to compare the price of the special order with the relevant costs of producing, packaging, and shipping the order. The relevant costs include the variable costs, variable

selling costs (if any), and other costs directly associated with the special order (e.g., freight, insurance, and packaging and labeling the product). Another approach to this kind of decision is to prepare a special order bid price by calculating a minimum selling price for the special order. The bid price must cover the relevant costs and an estimated profit.

For example, suppose Home State Bank has been approved to provide and service four ATMs at a special event. The event sponsors want the fee reduced to \$0.50 per ATM transaction. At past special events, ATM use has averaged 2,000 transactions per machine. Home State Bank has located four idle ATMs and determined the following additional information:

ATM Cost Data for Annual Use of One Machine (400,000 Transactions)

Direct materials	\$0.10
Direct labor	0.05
Variable overhead	0.20
Fixed overhead ($\$100,000 \div 400,000$)	0.25
Advertising ($\$60,000 \div 400,000$)	0.15
Other fixed selling and administrative expenses ($\$120,000 \div 400,000$)	<u>0.30</u>
Cost per transaction	<u>\$1.05</u>
Regular fee per transaction	<u>\$1.50</u>

Should Home State Bank accept the special event offer?

An incremental analysis of the decision in the contribution margin reporting format appears in Exhibit 10-3. The report shows the contribution margin for Home State Bank's operations both with and without the special order. Fixed costs are not included because the only costs affected by the order are direct materials, direct labor, and variable overhead.

- **Price and relevant cost comparison:** The net result of accepting the special order is a \$1,200 increase in contribution margin (and, correspondingly, in

EXHIBIT 10-3

Incremental Analysis:
Special Order Decision

	Home State Bank Special Order Decision Incremental Analysis		Difference in Favor of Accepting Order
	Without Order	With Order	
Sales	<u>\$2,400,000</u>	<u>\$2,404,000</u>	<u>\$ 4,000</u>
Less variable costs			
Direct materials	\$ 160,000	\$ 160,800	(\$ 800)
Direct labor	80,000	80,400	(400)
Variable overhead	320,000	321,600	(1,600)
Total variable costs	<u>\$ 560,000</u>	<u>\$ 562,800</u>	<u>(\$ 2,800)</u>
Contribution margin	<u>\$1,840,000</u>	<u>\$1,841,200</u>	<u>\$ 1,200</u>

operating income). The analysis reveals that Home State Bank should accept the special order. The \$1,200 increase is verified by the following incremental analysis:

Special order sales [(2,000 transactions × 4) × \$0.50]	\$4,000
Less variable costs	
Direct materials (8,000 transactions × \$0.10)	\$ 800
Direct labor (8,000 transactions × \$0.05)	400
Variable overhead (8,000 transactions × \$0.20)	<u>1,600</u>
Total variable costs	2,800
Special order contribution margin	<u>\$1,200</u>

- **Minimum bid price for special order:** Now let us assume that the event sponsor asks Home State Bank what its minimum special order price is. If the incremental costs for the special order are \$2,800, the relevant cost per transaction is \$0.35 ($\$2,800 \div 8,000$). The special order price should cover this cost and generate a profit. If Home State Bank would like to earn \$800 from the special order, the special order price should be \$0.45 [$\0.35 cost per transaction plus $\$0.10$ profit per transaction ($\$800 \div 8,000$ transactions)].

Of course, the Home State Bank management's decisions must be consistent with the bank's strategic plan and tactical objectives, and it must take into account not only costs and revenues but also relevant qualitative factors. Qualitative factors that might influence the decision are (1) the impact of the special order on regular customers, (2) the potential of the special order to lead into new sales areas, and (3) the customer's ability to maintain an ongoing relationship that includes good ordering and paying practices.

STOP & APPLY >

Sample Company has received an order for Product EZ at a special selling price of \$26 per unit (suggested retail price is \$30). This order is over and above normal production, and budgeted production and sales targets for the year have already been exceeded. Capacity exists to satisfy the special order. No selling costs will be incurred in connection with this order. Unit costs to manufacture and sell Product EZ are as follows: direct materials, \$7.00; direct labor, \$10.00; variable overhead, \$8.00; fixed manufacturing costs, \$5.00; variable selling costs, \$3.00; and fixed general and administrative costs, \$9.00. Should Sample Company accept the order?

SOLUTION

Variable Costs to Produce Product EZ

Direct materials	\$ 7.00
Direct labor	10.00
Variable overhead	8.00
Total variable costs to produce	<u>\$25.00</u>

Sample Company should accept the special order because the offered price exceeds the variable manufacturing costs.

Incremental Analysis for Segment Profitability Decisions

LO4 Perform incremental analysis for segment profitability decisions.

Another type of operating decision that management must make is whether to keep or drop unprofitable segments, such as product lines, services, sales territories, divisions, departments, stores, or outlets. Management must select the alternative that maximizes operating income. The objective of the decision analysis is to identify the segments that have a negative segment margin so that managers can drop them or take corrective action.

A **segment margin** is a segment's sales revenue minus its direct costs (direct variable costs and direct fixed costs traceable to the segment). Such costs are assumed to be **avoidable costs**. An avoidable cost could be eliminated if management were to drop the segment.

- ▶ If a segment has a positive segment margin—that is, the segment's revenue is greater than its direct costs—it is able to cover its own direct costs and contribute a portion of its revenue to cover common costs and add to operating income. In that case, management should keep the segment.
- ▶ If a segment has a negative segment margin—that is, the segment's revenue is less than its direct costs—management should eliminate the segment.

However, certain common costs will be incurred regardless of the decision. Those are unavoidable costs, and the remaining segments must have sufficient contribution margin to cover their own direct costs and the common costs.

Segment Profitability Analysis An analysis of segment profitability includes the preparation of a segmented income statement using variable costing to identify variable and fixed costs. The fixed costs that are traceable to the segments are called *direct fixed costs*. The remaining fixed costs are *common costs* and are not assigned to segments.

Suppose Home State Bank wants to determine if it should eliminate its Safe Deposit Division. Managers prepare a segmented income statement, separating variable and fixed costs to calculate the contribution margin. They separate the total fixed costs of \$84,000 further by directly tracing \$55,500 to Bank Operations and \$16,500 to the Safe Deposit Division; the remaining \$12,000 are common fixed costs. The following segmented income statement shows the segment margins for Bank Operations and the Safe Deposit Division and the operating income for the total company:

	Bank Operations	Safe Deposit Division	Total Company
Sales	\$135,000	\$15,000	\$150,000
Less variable costs	<u>52,500</u>	<u>7,500</u>	<u>60,000</u>
Contribution margin	\$ 82,500	\$ 7,500	\$ 90,000
Less direct fixed costs	<u>55,500</u>	<u>16,500</u>	<u>72,000</u>
Segment margin	<u>\$ 27,000</u>	<u>(\$ 9,000)</u>	<u>\$ 18,000</u>
Less common fixed costs			<u>12,000</u>
Operating income			<u>\$ 6,000</u>

EXHIBIT 10-4

Incremental Analysis:
Segment Profitability Decision

Home State Bank Segment Profitability Decision Incremental Analysis—Situation 1			
	Keep Safe Deposit Division	Drop Safe Deposit Division	Difference in Favor of Dropping Safe Deposit Division
Sales	\$150,000	\$135,000	(\$15,000)
Less variable costs	<u>60,000</u>	<u>52,500</u>	<u>7,500</u>
Contribution margin	\$ 90,000	\$ 82,500	(\$ 7,500)
Less direct fixed costs	<u>72,000</u>	<u>55,500</u>	<u>16,500</u>
Segment margin	\$ 18,000	\$ 27,000	\$ 9,000
Less common fixed costs	<u>12,000</u>	<u>12,000</u>	<u>0</u>
Operating income	<u>\$ 6,000</u>	<u>\$ 15,000</u>	<u>\$ 9,000</u>

Home State Bank Segment Profitability Decision Incremental Analysis—Situation 2			
	Keep Safe Deposit Division	Drop Safe Deposit Division	Difference in Opposition to Dropping Safe Deposit Division
Sales	\$150,000	\$108,000	(\$42,000)
Less variable costs	<u>60,000</u>	<u>42,000</u>	<u>18,000</u>
Contribution margin	\$ 90,000	\$ 66,000	(\$24,000)
Less direct fixed costs	<u>72,000</u>	<u>55,500</u>	<u>16,500</u>
Segment margin	\$ 18,000	\$ 10,500	(\$ 7,500)
Less common fixed costs	<u>12,000</u>	<u>12,000</u>	<u>0</u>
Operating income	<u>\$ 6,000</u>	<u>(\$ 1,500)</u>	<u>(\$ 7,500)</u>

Exhibit 10-4 presents two situations. Situation 1 demonstrates that dropping the Safe Deposit Division will increase operating income by \$9,000. Unless the bank can increase the division's segment margin by increasing sales revenue or by reducing direct costs, management should drop the segment. The incremental approach to analyzing this decision isolates the segment and focuses on its segment margin, as shown in the last column of the exhibit. The decision to drop a segment also requires a careful review of the other segments to see whether they will be affected.

Situation 2 in Exhibit 10-4 assumes that Bank Operation's sales volume and variable costs will decrease by 20 percent if management eliminates the Safe Deposit Division. The reduction in sales volume stems from the loss of customers who purchase products from both divisions. The analysis shows that dropping the division would reduce both the segment margin and the bank's operating income by \$7,500. In this situation, Home State Bank would want to keep the Safe Deposit Division.



FOCUS ON BUSINESS PRACTICE

Why Banks Prefer Ebanking

After performing segment analysis of online banking and face-to-face banking, bank managers worldwide are encouraging customers to do their banking over the Internet. Banks have found that linking global Internet access

with customer relationship management (CRM), customer-friendly financial software, and online bill payment in a secure banking environment can reduce costs, increase service and product availability, and boost earnings.²

STOP & APPLY >

Sample Company is evaluating its two divisions, East Division and West Division. Data for East Division include sales of \$500,000, variable costs of \$250,000, and fixed costs of \$400,000, 50 percent of which are traceable to the division. West Division's data for the same period include sales of \$600,000, variable costs of \$350,000, and fixed costs of \$450,000, 60 percent of which are traceable to the division.

Should either division be considered for elimination?

SOLUTION

	East Division	West Division	Total Company
Sales	\$ 500,000	\$ 600,000	\$1,100,000
Less variable costs	<u>250,000</u>	<u>350,000</u>	<u>600,000</u>
Contribution margin	\$ 250,000	\$ 250,000	\$ 500,000
Less direct fixed costs	<u>200,000</u>	<u>270,000</u>	<u>470,000</u>
Divisional income	<u>\$ 50,000</u>	<u>(\$ 20,000)</u>	\$ 30,000
Less common fixed costs			<u>380,000</u>
Operating income (loss)			<u>(\$ 350,000)</u>

The company should keep East Division because it is profitable. West Division does not seem to be profitable and should be considered for elimination. The home office and its very heavy overhead costs are causing the company's loss.

Incremental Analysis for Sales Mix Decisions

L05 Perform incremental analysis for sales mix decisions involving constrained resources.

A company may not be able to provide the full variety of products or services that customers demand within a given time. Limits on resources like machine time or available labor may restrict the types or quantities of products or services that are available. Resource constraints can also be associated with other activities, such as inspection and equipment setup. The question is, Which products or services contribute the most to profitability in relation to the amount of capital assets or other constrained resources needed to offer those items? To satisfy customers' demands and maximize operating income, management will choose to offer the most profitable product or service first. To identify such products or services,

managers calculate the contribution margin per constrained resource (such as labor hours or machine hours) for each product or service.

Study Note

When resources like direct materials, direct labor, or machine time are scarce, the goal is to maximize the contribution margin per unit of scarce resource.

Sales Mix Analysis The objective of a **sales mix decision** is to select the alternative that maximizes the contribution margin per constrained resource. The decision analysis, which uses incremental analysis to identify the relevant costs and revenues, consists of two steps:

- Step 1.** Calculate the contribution margin per unit for each product or service affected by the constrained resource. The contribution margin per unit equals the selling price per unit less the variable costs per unit.
- Step 2.** Calculate the contribution margin per unit of the constrained resource. The contribution margin per unit of the constrained resource equals the contribution margin per unit divided by the quantity of the constrained resource required per unit.

Suppose Home State Bank offers three types of loans: commercial loans, auto loans, and home loans. The product line data are as follows:

	<i>Commercial Loans</i>	<i>Auto Loans</i>	<i>Home Loans</i>
Current loan application demand	20,000	30,000	18,000
Processing hours per loan application	2.0	1.0	2.5
Loan origination fee	\$24.00	\$18.00	\$32.00
Variable processing costs	\$12.50	\$10.00	\$18.75
Variable selling costs	\$6.50	\$5.00	\$6.25

The current loan application capacity is 100,000 processing hours.

- Question 1.** Which loan type should be advertised and promoted first because it is the most profitable for the bank? Which should be second? Which last?

Exhibit 10-5 shows the sales mix analysis. It indicates that the auto loans should be promoted first because they provide the highest contribution margin per processing hour. Home loans should be second, and commercial loans should be last.

- Question 2.** How many of each type of loan should the bank sell to maximize its contribution margin based on the current loan application capacity of 100,000 processing hours? What is the total contribution margin for that combination?

To begin the analysis, compare the current loan application capacity with the total capacity required to meet the current loan demand. The company needs 115,000 processing hours to meet the current loan demand: 40,000 processing hours for commercial loans (20,000 loans \times 2 processing hours per loan), 30,000 processing hours for auto loans (30,000 loans \times 1 processing hour per loan), and 45,000 processing hours for home loans (18,000 loans \times 2.5 processing hours per loan). Because that amount exceeds the current capacity of 100,000 processing hours, management must determine the sales mix that maximizes the company's contribution margin, which will also maximize its operating income.

EXHIBIT 10-5

Incremental Analysis: Sales Mix
Decision Involving Constrained
Resources

Home State Bank
Sales Mix Decision: Ranking the Order of Loans
Incremental Analysis

	Commercial Loans	Auto Loans	Home Loans
Loan origination fee per loan	<u>\$24.00</u>	<u>\$18.00</u>	<u>\$32.00</u>
Less variable costs			
Processing	\$12.50	\$10.00	\$18.75
Selling	<u>6.50</u>	<u>5.00</u>	<u>6.25</u>
Total variable costs	<u>\$19.00</u>	<u>\$15.00</u>	<u>\$25.00</u>
Contribution margin per loan (A)	<u>\$ 5.00</u>	<u>\$ 3.00</u>	<u>\$ 7.00</u>
Processing hours per loan (B)	<u>÷ 2.0</u>	<u>÷ 1.0</u>	<u>÷ 2.5</u>
Contribution margin per processing hour (A ÷ B)	<u>\$ 2.50</u>	<u>\$ 3.00</u>	<u>\$ 2.80</u>

Home State Bank
Sales Mix Decision: Number of Units to Make
Incremental Analysis

	Processing Hours
Total processing hours available	100,000
Less processing hours to produce auto loans (30,000 loans × 1 processing hour per loan)	<u>30,000</u>
Balance of processing hours available	70,000
Less processing hours to produce home loans (18,000 loans × 2.5 processing hours per loan)	<u>45,000</u>
Balance of processing hours available	25,000
Less processing hours to produce commercial loans (12,500 loans × 2 processing hours per loan)	<u>25,000</u>
Balance of processing hours available	<u>0</u>

The calculations in the second part of Exhibit 10-5 show that Home State Bank should sell 30,000 auto loans, 18,000 home loans, and 12,500 commercial loans. The total contribution margin is as follows:

Auto loans (30,000 loans × \$3.00 per loan)	\$ 90,000
Home loans (18,000 loans × \$7.00 per loan)	126,000
Commercial loans (12,500 loans × \$5.00 per loan)	<u>62,500</u>
Total contribution margin	<u>\$278,500</u>

STOP & APPLY >

Surf, Inc., makes three kinds of surfboards, but it has a limited number of machine hours available to make them. Product line data are as follows:

	Fiberglass	Plastic	Graphite
Machine hours per unit	4	1	2
Selling price per unit	\$1,500	\$800	\$1,300
Variable manufacturing cost per unit	500	200	800
Variable selling costs per unit	200	350	200

In what order should the surfboard product lines be produced?

SOLUTION

	Fiberglass	Plastic	Graphite
Selling price per unit	<u>\$1,500</u>	<u>\$800</u>	<u>\$1,300</u>
Less variable costs			
Manufacturing	\$ 500	\$200	\$ 800
Selling	<u>200</u>	<u>350</u>	<u>200</u>
Total unit variable costs	<u>\$ 700</u>	<u>\$550</u>	<u>\$1,000</u>
Contribution margin per unit (A)	<u>\$ 800</u>	<u>\$250</u>	<u>\$ 300</u>
Machine hours per unit (B)	<u>÷ 4</u>	<u>÷ 1</u>	<u>÷ 2</u>
Contribution margin per machine hour (A ÷ B)	<u>\$ 200</u>	<u>\$250</u>	<u>\$ 150</u>

Surf, Inc., should produce plastic surfboards first, then fiberglass surfboards, and finally graphite surfboards.

Incremental Analysis for Sell or Process-Further Decisions

LO6 Perform incremental analysis for sell or process-further decisions.

Study Note

Products are made by combining materials or by dividing materials, as in oil refining or ore extraction.

Some companies offer products or services that can either be sold in a basic form or be processed further and sold as a more refined product or service to a different market. For example, a meatpacking company processes cattle into meat and meat-related products, such as bones and hides. The company may choose to sell sides of beef and pounds of bones and hides to other companies for further processing. Alternatively, it could choose to cut and package the meat for immediate sale in grocery stores, process bone into fertilizer for gardeners, or tan hides into refined leather for purses.

A **sell or process-further decision** is a decision about whether to sell a joint product at the split-off point or sell it after further processing. **Joint products** are two or more products made from a common material or process that cannot be identified as separate products or services during some or all of the processing. Only at a specific point, called the **split-off point**, do joint products or services become separate and identifiable. At that point, a company may choose to sell the product or service as is or to process it into another form for sale to a different market.

Sell or Process-Further Analysis The objective of a sell or process-further decision is to select the alternative that maximizes operating income. The decision analysis entails calculating the incremental revenue, which is the difference between the total revenue if the product or service is sold at the split-off point

and the total revenue if the product or service is sold after further processing. You then compare the incremental revenue with the incremental costs of processing further.

- ▶ If the incremental revenue is greater than the incremental costs of processing further, a decision to process the product or service further would be justified.
- ▶ If the incremental costs are greater than the incremental revenue, you would probably choose to sell the product or service at the split-off point.

Study Note

The common costs shared by two or more products before they are split off are called *joint costs*. Joint costs are irrelevant in a sell or process-further decision.

Be sure to ignore *joint costs* (or common costs) in your analysis, because they are incurred *before* the split-off point and do not change if further processing occurs. Although accountants assign joint costs to products or services when valuing inventories and calculating cost of goods sold, joint costs are not relevant to a sell or process-further decision and are omitted from the decision analysis.

For example, as part of the company's strategic plan, Home State Bank's management is looking for new markets for banking services, and management is considering whether it would be profitable to bundle banking services. Home State Bank is considering adding two levels of service, Premier Checking and Personal Banker, beyond its current Basic Checking account services. The three levels have the following bundled features:

- ▶ Basic Checking: Online checking account, debit card, and online bill payment with a required minimum average balance of \$500
- ▶ Premier Checking: Paper and online checking, a debit card, a credit card, and a small life insurance policy equal to the maximum credit limit on the credit card for customers who maintain a minimum average balance of \$1,000
- ▶ Personal Banker: All of the features of Premier Checking plus a safe deposit box, a \$5,000 personal line of credit at the prime interest rate, financial investment advice, and a toaster upon opening the account for customers who maintain a minimum average balance of \$5,000

Assume that the bank can earn sales revenue of 5 percent on its checking account balances and that the total cost of offering basic checking services is currently \$50,000. The bank's accountant provided these data for each level of service:

<i>Product</i>	<i>Sales Revenue</i>	<i>Additional Costs</i>
Basic Checking	\$ 25	\$ 0
Premier Checking	50	30
Personal Banker	250	200

The decision analysis in Exhibit 10-6 indicates that the bank should offer Personal Banking services in addition to Basic Checking accounts. Notice that the \$50,000 joint costs of Basic Checking were ignored because they are sunk costs that will not influence the decision.

As we noted earlier, the decision analysis must take into account the organization's strategic plan and tactical objectives. In this example, the decision to process services further supports the bank's strategic plan to expand into new markets. In making the final decision, management must also consider other factors, such as the bank's ability to obtain favorable returns on its bank deposit investments.

EXHIBIT 10-6

Incremental Analysis:
Sell or Process-Further Decision

Home State Bank		
Sell or Process-Further Decision		
Incremental Analysis		
	Premier Checking	Personal Banker
Incremental revenue per account if processed further:		
Process further	\$50	\$250
Split-off—Basic Checking	<u>25</u>	<u>25</u>
Incremental revenue	\$25	\$225
Less incremental costs	<u>30</u>	<u>200</u>
Operating income (loss) from processing further	<u>(\$ 5)</u>	<u>\$ 25</u>

STOP**& APPLY >**

In an attempt to provide superb customer service, Home Movie Rentals is considering expanding its product offerings from single movie or game rentals to complete movie or game evenings. Each evening would include a movie or game, candy, popcorn, and drinks. The accountant for Home Movie Rentals has compiled the following relevant information:

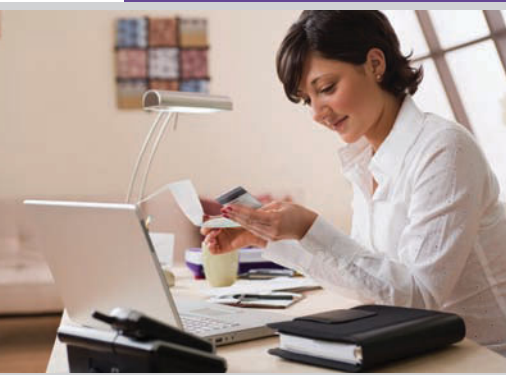
Product	Sales Revenue if No Additional Service	Sales Revenue if Processed Further	Additional Processing Costs
Movie	\$2	\$10	\$5
Game	1	6	5

Determine which products Home Movie Rentals should offer.

SOLUTION**Incremental Revenue if
Processed Further**

	Movie Evening	Game Evening
Process further	\$10	\$6
Split-off	<u>2</u>	<u>1</u>
Incremental revenue	\$ 8	\$5
Less incremental costs	<u>5</u>	<u>5</u>
Operating income from further processing	<u>\$ 3</u>	<u>\$0</u>

Home Movie Rentals should promote movie evenings first, then movies, and finally games or game evenings. There is no difference in profitability between the sale of games and the sale of game evenings.

A LOOK BACK AT ► **BANK OF AMERICA**

In this chapter's Decision Point, we commented on **Bank of America's** online banking strategies. We asked the following questions:

- How do managers at Bank of America decide on new ways to increase business and protect customers' interests?
- How can incremental analysis help managers at Bank of America take advantage of the business opportunities that online banking offers?

As managers at Bank of America make short-term decisions about which alternatives to pursue that will increase business and give customers additional protection against fraud and identity theft, they will ask a number of questions—for example: When should bank products and services be outsourced? When should a special order for service be accepted? When is a bank segment profitable? When resource constraints exist, what is the best sales mix? When should bank products be sold as is or processed further into different products?

To answer such questions and determine what could happen under alternative courses of action, the bank's managers need pertinent information that they can use in incremental analysis. On that basis, they can make sound, ethical decisions that will protect the bank's customers and increase both its traditional and online business.

Review Problem

Segment Profitability

LO4

Suppose a loan officer at **Bank of America** has been analyzing Home Services, Inc., to determine whether the bank should grant it a loan. Home Services has been in business for ten years, and its services now include tree trimming and auto, boat, and tile floor repair. The following data pertaining to those services were available for analysis:

	A	B	C	D	E	F	G
1	Home Services, Inc.						
2	Segmented Income Statement						
3	For the Year Ended December 31, 2011						
4							
5					Tile		
6		Auto	Boat	Floor	Tree		Total
7		Repair	Repair	Repair	Trimming		Impact
8	Sales	\$297,500	\$114,300	\$126,400	\$ 97,600		\$635,800
9	Less variable costs						
10	Direct labor	\$119,000	\$ 40,005	\$ 44,240	\$ 34,160		\$237,405
11	Operating supplies	14,875	5,715	6,320	4,880		31,790
12	Small tools	11,900	4,572	5,056	7,808		29,336
13	Replacement parts	59,500	22,860	25,280	–		107,640
14	Truck costs	–	11,430	12,640	14,640		38,710
15	Selling costs	44,625	17,145	18,960	9,760		90,490
16	Other variable costs	5,950	2,286	2,528	1,952		12,716
17	Contribution margin	\$ 41,650	\$ 10,287	\$ 11,376	\$ 24,400		\$ 87,713
18	Less direct fixed costs	35,800	16,300	24,100	5,200		81,400
19	Segment margin	\$ 5,850	(\$ 6,013)	(\$ 12,724)	\$ 19,200		\$ 6,313
20	Less common fixed						
21	costs						32,100
22	Operating income						
23	(loss)						(\$ 25,787)
24							

Home Services' profitability has decreased over the past two years, and to increase the likelihood that the company will qualify for a loan, the loan officer has advised its owner, Dale Bandy, to determine which service lines are not meeting the company's profit targets. Once Bandy has identified the unprofitable service lines, he can either eliminate them or set higher prices. If he sets higher prices, those prices will have to cover all variable and fixed operating, selling, and general administration costs.

Required

1. Analyze the performance of the four service lines. Should Dale Bandy eliminate any of them? Explain your answer.
2. Why might Bandy want to continue providing unprofitable service lines?
3. Identify possible causes of a service's poor performance. What actions do you think Bandy should take to make his company a better loan candidate?

**Answers to
Review Problem**

1. In deciding whether to eliminate any of the four service lines, Dale Bandy should concentrate on those that have a negative segment margin. If the revenues from a service line are less than the sum of its variable and direct fixed costs, then other service lines must cover some of the losing line's costs and carry the burden of the common fixed costs.

The segmented income statement on the opposite page indicates that Bandy will increase the company's operating income by \$18,737 (\$6,013 + \$12,724) if he eliminates the boat and tile floor repair services, both of which have a negative segment margin. A decision to eliminate these services can also be supported by the following analysis:

	A	B	C	D	E
1	Home Services, Inc.				
2	Segment Profitability Decision				
3					
4					Difference in
5					Favor of
6			Keep	Drop	Dropping
7			Boat Repair	Boat Repair	Boat Repair
8			and	and	and
9			Tile Floor Repair	Tile Floor Repair	Tile Floor Repair
10	Sales		\$635,800	\$395,100	(\$240,700)
11	Less variable costs		548,087	329,050	219,037
12	Contribution margin		\$ 87,713	\$ 66,050	(\$ 21,663)
13	Less direct fixed costs		81,400	41,000	40,400
14	Segment margin		\$ 6,313	\$ 25,050	\$ 18,737
15	Less common fixed costs		32,100	32,100	-
16	Operating income (loss)		(\$ 25,787)	(\$ 7,050)	\$ 18,737

2. Bandy may want to continue offering the unprofitable service lines if their elimination would have a negative effect on the sale of the auto repair or tree trimming services.

3. The following are among the possible causes of a service's poor performance:

- a. Service fees set too low
- b. Inadequate advertising
- c. Excessively high direct labor costs
- d. Other variable costs excessively high
- e. Poor management of fixed costs
- f. Excessive supervision costs

To improve profitability and make the company a better candidate for a bank loan, Bandy should eliminate nonvalue-adding costs, increase service fees, or increase the volume of services provided to customers.


STOP & REVIEW >
LO1 Describe how managers make short-run decisions using incremental analysis.

Both quantitative information and qualitative information are important in short-run decision analysis. Such information should be relevant, timely, and presented in a format that is easy to use in decision making.

Incremental analysis helps managers compare alternative courses of action by focusing on the differences in projected revenues and costs. Any data that relate to future costs, revenues, or uses of resources and that will differ among alternative courses of action are considered relevant decision information. Examples of relevant information are projected sales or estimated costs, such as the costs of direct materials or direct labor, that differ for each alternative. The manager analyzes relevant information to determine which alternative contributes the most to profits or incurs the lowest costs. Only data that differ for each alternative are considered. Differential or incremental costs are costs that vary among alternatives and thus are relevant to the decision. Sunk costs are past costs that cannot be recovered; they are irrelevant to the decision process. Opportunity costs are revenue or income forgone as a result of choosing an alternative.

LO2 Perform incremental analysis for outsourcing decisions.

Outsourcing (including make-or-buy) decision analysis helps managers decide whether to use suppliers from outside the organization to perform services or provide goods that could be performed or produced internally. An incremental analysis of the expected costs and revenues for each alternative is used to identify the best alternative.

LO3 Perform incremental analysis for special order decisions.

A special order decision is a decision about whether to accept or reject a special order at a price below the normal market price. One approach is to compare the special order price with the relevant costs to see if a profit can be generated. Another approach is to prepare a special order bid price by calculating a minimum selling price for the special order. Generally, fixed costs are irrelevant to a special order decision because such costs are covered by regular sales activity and do not differ among alternatives.

LO4 Perform incremental analysis for segment profitability decisions.

Segment profitability decisions involve the review of segments of an organization, such as product lines, services, sales territories, divisions, or departments. Managers often must decide whether to add or drop a segment. A segment with a negative segment margin may be dropped. A segment margin is a segment's sales revenue minus its direct costs, which include variable costs and avoidable fixed costs. Avoidable costs are traceable to a specific segment. If the segment is eliminated, the avoidable costs will also be eliminated.

LO5 Perform incremental analysis for sales mix decisions involving constrained resources.

Sales mix decisions require the selection of the most profitable combination of sales items when a company makes more than one product or service using a common constrained resource. The product or service generating the highest contribution margin per constrained resource is offered and sold first.

LO6 Perform incremental analysis for sell or process-further decisions.

Sell or process-further decisions require managers to choose between selling a joint product at its split-off point or processing it into a more refined product. Managers compare the incremental revenues and costs of the two alternatives. Joint processing costs are irrelevant to the decision because they are identical for both alternatives. A product should be processed further only if the incremental revenues generated exceed the incremental costs incurred.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Avoidable costs 402 (LO4)	Make-or-buy decisions 397 (LO2)	Sell or process-further decision 407 (LO6)
Differential cost 395 (LO1)	Opportunity costs 396 (LO1)	Short-run decision analysis 394 (LO1)
Incremental analysis 395 (LO1)	Outsourcing 367 (LO2)	Special order decisions 399 (LO3)
Joint products 407 (LO6)	Sales mix decision 405 (LO5)	Split-off point 407 (LO6)
	Segment margin 402 (LO4)	Sunk cost 395 (LO1)

CHAPTER ASSIGNMENTS

BUILDING Your Knowledge Foundation

Short Exercises

L01 Qualitative and Quantitative Information in Short-Run Decision Analysis

SE 1. The owner of Milo's, a Mexican restaurant, is deciding whether to take fish tacos off the menu. State whether each item of decision information that follows is qualitative or quantitative. If the information is quantitative, specify whether it is financial or nonfinancial.

1. The time needed to prepare the fish
2. The daily number of customers who order the tacos
3. Whether competing Mexican restaurants have this entrée on the menu
4. The labor cost of the chef who prepares the fish tacos
5. The fact that the president of a nearby company who brings ten guests with him each week always orders fish tacos

L01 Using Incremental Analysis

SE 2. Pices Corporation has assembled the following information related to the purchase of a new automated postage machine:

	Posen Machine	Value Machine
Increase in revenue	\$44,200	\$49,300
Increase in annual operating costs		
Direct materials	12,200	12,200
Direct labor	10,200	10,600
Variable overhead	24,500	26,900
Fixed overhead (including depreciation)	12,400	12,400

Using incremental analysis and only relevant information, compute the difference in favor of the Value machine.

L02 Outsourcing Decision

SE 3. Marc Company assembles products from a group of interconnecting parts. The company produces some of the parts and buys some from outside vendors. The vendor for Part X has just increased its price by 35 percent, to \$10 per unit for the first 5,000 units and \$9 per additional unit ordered each year. The company uses 7,500 units of Part X each year. Unit costs if the company makes the part are as follows:

Direct materials	\$3.50
Direct labor	2.00
Variable overhead	4.00
Variable selling costs for the assembled product	3.75

Should Marc continue to purchase Part X or begin making it?

L02 Outsourcing Decision

SE 4. Dental Associates, Inc., is currently operating at less than capacity. The company thinks it could cut costs by outsourcing dental cleaning to an independent dental hygienist for \$50 per cleaning. Currently, a dental hygienist is employed for \$30 an hour. A dental cleaning usually takes one hour to perform and consumes \$10 of dental supplies, \$8 of variable overhead, and \$16 of fixed overhead. Should Dental Associates, Inc., continue to perform dental cleanings, or should it begin to outsource them?

L03 Special Order Decision

SE 5. Hadley Company has received a special order for Product R3P at a selling price of \$20 per unit. This order is over and above normal production, and budgeted production and sales targets for the year have already been exceeded. Capacity exists to satisfy the special order. No selling costs will be incurred in connection with this order. Unit costs to manufacture and sell Product R3P are as follows: direct materials, \$7.60; direct labor, \$3.75; variable overhead, \$9.25; fixed overhead, \$4.85; variable selling costs, \$2.75; and fixed general and administrative costs, \$6.75. Should Hadley Company accept the order?

L03 Special Order Decision

SE 6. Smith Accounting Services is considering a special order that it received from one of its corporate clients. The special order calls for Smith to prepare the individual tax returns of the corporation's four-largest shareholders. The company has idle capacity that could be used to complete the special order. The following data have been gathered about the preparation of individual tax returns:

Materials cost per page	\$1
Average hourly labor rate	\$60
Standard hours per return	4
Standard pages per return	10
Variable overhead cost per page	\$0.50
Fixed overhead cost per page	\$0.50

Smith Accounting Services would be satisfied with a \$40 gross profit per return. Compute the minimum bid price for the entire order.

L04 Segment Profitability Decision

SE 7. Peruna Company is evaluating its two divisions, North Division and South Division. Data for North Division include sales of \$530,000, variable costs of \$290,000, and fixed costs of \$260,000, 50 percent of which are traceable to the division. South Division's efforts for the same period include sales of \$610,000, variable costs of \$340,000, and fixed costs of \$290,000, 60 percent of which are traceable to the division. Should Peruna Company consider eliminating either division? Is there any other problem that needs attention?

L05 Sales Mix Decision

SE 8. Snow, Inc., makes three kinds of snowboards, but it has a limited number of machine hours available to make them. Product line data are as follows:

	Wood	Plastic	Graphite
Machine hours per unit	1.25	1.0	1.5
Selling price per unit	\$100	\$120	\$200
Variable manufacturing cost per unit	\$45	\$50	\$100
Variable selling costs per unit	\$15	\$26	\$36

In what order should the snowboard product lines be produced?

L06 Sell or Process-Further Decision

SE 9. Gomez Industries produces three products from a single operation. Product A sells for \$4 per unit, Product B for \$6 per unit, and Product C for \$10 per unit. When B is processed further, there are additional unit costs of \$3, and its new selling price is \$10 per unit. Each product is allocated \$2 of joint costs from the initial production operation. Should Product B be processed further, or should it be sold at the end of the initial operation?

LO6 Sell or Process-Further Decision

SE 10. In an attempt to provide superb customer service, Richard V. Meats is considering the expansion of its product offerings from whole hams and turkeys to complete ham and turkey dinners. Each dinner would include a carved ham or turkey, two side dishes, and six rolls or cornbread. The accountant for Richard V. Meats has compiled the following relevant information:

Product	Sales Revenue if No Additional Service	Sales Revenue if Processed if Further	Additional Processing Costs
Ham	\$30	\$50	\$15
Turkey	20	35	15

A cooked, uncarved ham costs Richard V. Meats \$20 to produce, and a cooked, uncarved turkey costs \$15 to prepare. Use incremental analysis to determine which products Richard V. Meats should offer.

Exercises**LO1 Incremental Analysis**

E 1. Max Wayco, the business manager for Essey Industries, must select a new computer system for his assistant. Rental of Model A, which is similar to the model now being used, is \$2,200 per year. Model B is a deluxe system that rents for \$2,900 per year and will require a new desk for the assistant. The annual desk rental charge is \$750. The assistant's salary of \$1,200 per month will not change. If Model B is rented, \$280 in annual software training costs will be incurred. Model B has greater capacity and is expected to save \$1,550 per year in part-time wages. Upkeep and operating costs will not differ between the two models.

1. Identify the relevant data in this problem.
2. Prepare an incremental analysis to aid the business manager in his decision.

LO1 Incremental Analysis

E 2. The managers of Lennox Company must decide which of two mill blade grinders—Y or Z—to buy. The grinders have the same purchase price but different revenue and cost characteristics. The company currently owns Grinder X, which it bought three years ago for \$15,000 and which has accumulated depreciation of \$9,000 and a book value of \$6,000. Grinder X is now obsolete as a result of advances in technology and cannot be sold or traded in.

The accountant has collected the following annual revenue and operating cost estimates for the two new machines:

	Grinder Y	Grinder Z
Increase in revenue	\$16,000	\$20,000
Increase in annual operating costs		
Direct materials	4,800	4,800
Direct labor	3,000	4,100
Variable overhead	2,100	3,000
Fixed overhead (depreciation included)	5,000	5,000

1. Identify the relevant data in this problem.
2. Prepare an incremental analysis to aid the managers in their decision.
3. Should the company purchase Grinder Y or Grinder Z?

LO2 Outsourcing Decision

E 3. One component of a radio produced by Audio Systems, Inc., is currently being purchased for \$225 per 100 parts. Management is studying the possibility

of manufacturing that component. Annual production at Audio is 70,000 units; fixed costs (all of which remain unchanged whether the part is made or purchased) are \$38,500; and variable costs are \$0.95 per unit for direct materials, \$0.55 per unit for direct labor, and \$0.60 per unit for variable overhead.

Using incremental analysis, decide whether Audio Systems, Inc., should manufacture the part or continue to purchase it from an outside vendor.

L02 Outsourcing Decision

E 4. Sunny Hazel, the manager of Cyber Web Services, must decide whether to hire a new employee or to outsource some of the web design work to Ky To, a freelance graphic designer. If she hires a new employee, she will pay \$32 per design hour for the employee to work 600 hours and incur service overhead costs of \$2 per design hour. If she outsources the work to Ky To, she will pay \$36 per design hour for 600 hours of work. She can also redirect the use of a computer and server to generate \$4,000 in additional revenue from web page maintenance work.

Should Cyber Web Services hire a new designer or outsource the work to Ky To?

L03 Special Order Decision

E 5. Antiquities, Ltd., produces antique-looking books. Management has just received a request for a special order for 2,000 books and must decide whether to accept it. Venus Company, the purchaser, is offering to pay \$25.00 per book, which includes \$3.00 per book for shipping costs.

The variable production costs per book include \$9.20 for direct materials, \$4.00 for direct labor, and \$3.80 for variable overhead. The current year's production is 22,000 books, and maximum capacity is 25,000 books. Fixed costs, including overhead, advertising, and selling and administrative costs, total \$80,000. The usual selling price is \$25.00 per book. Shipping costs, which are additional, average \$3.00 per book.

Determine whether Antiquities should accept the special order.

L03 Special Order Decision

E 6. Jens Sporting Goods, Inc., manufactures a complete line of sporting equipment. Leiden Enterprises operates a large chain of discount stores. Leiden has approached Jens with a special order for 30,000 deluxe baseballs. Instead of being packaged separately, the balls are to be packed in boxes containing 500 baseballs each. Leiden is willing to pay \$2.45 per baseball. Jens knows that annual expected production is 400,000 baseballs. It also knows that the current year's production is 410,000 baseballs and that the maximum production capacity is 450,000 baseballs. The following additional information is available:

Standard unit cost data for 400,000 baseballs	
Direct materials	\$ 0.90
Direct labor	0.60
Overhead:	
Variable	0.50
Fixed ($\$100,000 \div 400,000$)	0.25
Packaging per unit	0.30
Advertising ($\$60,000 \div 400,000$)	0.15
Other fixed selling and administrative expenses ($\$120,000 \div 400,000$)	0.30
Product unit cost	<u>\$ 3.00</u>
Unit selling price	<u>\$ 4.00</u>
Total estimated bulk packaging costs for special order (30,000 baseballs: 500 per box)	<u>\$2,500</u>

1. Should Jens Sporting Goods, Inc., accept Leiden's offer?
2. What would be the minimum order price per baseball if Jens would like to earn a profit of \$3,000 from the special order?

L03 Special Order Decision

E 7. In September, a nonprofit organization, Toys for Homeless Children (THC), offers Virtually LLC \$400 to prepare a custom web page to help the organization attract toy donations. The home page for the THC website will include special animated graphics of toys and stuffed animals. Virtually LLC estimates that it will take 12 design labor hours at \$32 per design hour and 2 installation labor hours at \$10 per installation hour to complete the job. Fixed costs are already covered by regular business. Should Virtually LLC accept THC's offer?

L04 Elimination of Unprofitable Segment Decision

E 8. Guld's Glass, Inc., has three divisions: Commercial, Nonprofit, and Residential. The segmented income statement for last year revealed the following:

Guld's Glass, Inc.				
Divisional Profit Summary and Decision Analysis				
	Commercial Division	Nonprofit Division	Residential Division	Total Company
Sales	\$290,000	\$533,000	\$837,000	\$1,660,000
Less variable costs	<u>147,000</u>	<u>435,000</u>	<u>472,000</u>	<u>1,054,000</u>
Contribution margin	\$143,000	\$ 98,000	\$365,000	\$ 606,000
Less direct fixed costs	<u>124,000</u>	<u>106,000</u>	<u>139,000</u>	<u>369,000</u>
Segment margin	<u>\$ 19,000</u>	<u>(\$ 8,000)</u>	<u>\$226,000</u>	\$ 237,000
Less common fixed costs				168,000
Operating income				<u>\$ 69,000</u>

1. How will Guld's Glass be affected if the Nonprofit Division is dropped?
2. Assume the elimination of the Nonprofit Division causes the sales of the Residential Division to decrease by 10 percent. How will Guld's Glass be affected if the Nonprofit Division is dropped?

L04 Elimination of Unprofitable Segment Decision

E 9. URL Services has two divisions: Basic Web Pages and Custom Web Pages. Ricky Vega, manager of Custom Web Pages, wants to find out why Custom Web Pages is not profitable. He has prepared the reports that appear on the next page.

1. How will URL Services be affected if the Custom Web Pages Division is eliminated?
2. How will URL Services be affected if the Design segment of Custom Web Pages is eliminated?
3. What should Ricky Vega do? What additional information would be helpful to him in making the decision?

URL Services
Segmented Income Statement
For the Year Ended December 31

	Basic Web Pages (1,000 units)	Custom Web Pages (200 units)	Total Company
Service revenue	\$200,000	\$150,000	\$350,000
Less variable costs			
Direct professional labor: design	\$ 32,000	\$ 80,000	\$112,000
Direct professional labor: install	30,000	4,000	34,000
Direct professional labor: maintain	15,000	36,000	51,000
Total variable costs	\$ 77,000	\$120,000	\$197,000
Contribution margin	<u>\$123,000</u>	<u>\$ 30,000</u>	<u>\$153,000</u>
Less direct fixed costs			
Depreciation on computer equipment	\$ 6,000	\$ 12,000	\$ 18,000
Depreciation on servers	10,000	20,000	30,000
Total direct fixed costs	<u>\$ 16,000</u>	<u>\$ 32,000</u>	<u>\$ 48,000</u>
Segment margin	<u>\$107,000</u>	<u>(\$ 2,000)</u>	<u>\$105,000</u>
Less common fixed costs			
Building rent			\$ 24,000
Supplies			1,000
Insurance			3,000
Telephone			1,500
Website rental			500
Total common fixed costs			<u>\$ 30,000</u>
Operating income			<u><u>\$ 75,000</u></u>

Custom Web Pages Division
URL Services
Segment Profitability Decision
Incremental Analysis

	Design	Install	Maintain	Total
Service revenue	\$60,000	\$25,000	\$65,000	\$150,000
Less variable costs	<u>80,000</u>	<u>4,000</u>	<u>36,000</u>	<u>120,000</u>
Contribution margin	(\$20,000)	\$21,000	\$29,000	\$ 30,000
Less direct fixed costs	<u>6,000</u>	<u>13,000</u>	<u>13,000</u>	<u>32,000</u>
Segment margin	<u>(\$26,000)</u>	<u>\$ 8,000</u>	<u>\$16,000</u>	<u>(\$ 2,000)</u>

L05 Scarce Resource Usage

E 10. EZ, Inc., manufactures two products that require both machine processing and labor operations. Although there is unlimited demand for both products, EZ could devote all its capacities to a single product. Unit prices, cost data, and processing requirements follow.

	Product E	Product Z
Unit selling price	\$70	\$230
Unit variable costs	\$30	\$90
Machine hours per unit	0.4	1.4
Labor hours per unit	2.0	6.0

Next year, the company will be limited to 160,000 machine hours and 120,000 labor hours. Fixed costs for the year are \$1,500,000.

1. Compute the most profitable combination of products to be produced next year.
2. Prepare an income statement using the contribution margin format for the product volume computed in 1.

L05 Sales Mix Decision

E 11. Grady Enterprises manufactures three computer games. They are called Rising Star, Ghost Master, and Road Warrior. The product line data are as follows:

	Rising Star	Ghost Master	Road Warrior
Current unit sales demand	20,000	30,000	18,000
Machine hours per unit	2.0	1.0	2.5
Selling price per unit	\$24.00	\$18.00	\$32.00
Unit variable manufacturing costs	\$12.50	\$10.00	\$18.75
Unit variable selling costs	\$6.50	\$5.00	\$6.25

The current production capacity is 110,000 machine hours.

1. Which computer game should be manufactured first? Which should be manufactured second? Which last?
2. How many of each type of computer game should be manufactured and sold to maximize the company's contribution margin based on the current production activity of 110,000 machine hours? What is the total contribution margin for that combination?

L05 Sales Mix Decision

E 12. Web Services, a small company owned by Simon Orozco, provides web page services to small businesses. His services include the preparation of basic pages and custom pages.

The following summary of information will be used to make several short-run decisions for Web Services:

	Basic Pages	Custom Pages
Service revenue per page	\$200	\$750
Variable costs per page	<u>77</u>	<u>600</u>
Contribution margin per page	<u>\$123</u>	<u>\$150</u>

Total annual fixed costs are \$78,000.

One of Web Services' two graphic designers, Taylor Campbell, is planning to take maternity leave in July and August. As a result, there will be only one designer available to perform the work, and design labor hours will be a resource constraint. Orozco plans to help the other designer complete the projected 160 orders for basic pages and 30 orders for custom pages for those two months. However, he wants to know which type of page Web Services should advertise and market. Although custom pages have a higher contribution margin per service, each custom page requires 12.5 design hours, whereas basic pages require only 1 design hour per page. On which page type should his company focus? Explain your answer.

LO6 Sell or Process-Further Decision

E 13. H & L Beef Products, Inc., processes cattle. It can sell the meat as sides of beef or process it further into final cuts (steaks, roasts, and hamburger). As part of the company's strategic plan, management is looking for new markets for meat or meat by-products. The production process currently separates hides and bones for sale to other manufacturers. However, management is considering whether it would be profitable to process the hides into leather and the bones into fertilizer. The costs of the cattle and of transporting, hanging, storing, and cutting sides of beef are \$125,000. The company's accountant provided these data:

Product	Sales Revenue if Sold at Split-Off	Sales Revenue if Sold After Further Processing	Additional Processing Costs
Meat	\$100,000	\$200,000	\$80,000
Bones	20,000	40,000	15,000
Hides	50,000	55,000	10,000

Should the products be processed further? Explain your answer.

LO6 Sell or Process-Further Decision

E 14. Six Star Pizza manufactures frozen pizzas and calzones and sells them for \$4 each. It is currently considering a proposal to manufacture and sell fully prepared products. The following relevant information has been gathered by management:

Product	Sales Revenue if No Additional Processing	Sales Revenue if Processed Further	Additional Processing Costs
Pizza	\$4	\$ 8	\$5
Calzone	4	10	5

Use incremental analysis to determine which products Six Star should offer.

Problems**LO2 Outsourcing Decision**

P 1. Stainless Refrigerator Company purchases ice makers and installs them in its products. The ice makers cost \$138 per case, and each case contains 12 ice makers. The supplier recently gave advance notice that the price will rise by 50 percent immediately. Stainless Refrigerator Company has idle equipment that with only a few minor changes could be used to produce similar ice makers.

Cost estimates have been prepared under the assumption that the company could make the product itself. Direct materials would cost \$100.80 per 12 ice makers. Direct labor required would be 10 minutes per ice maker at a labor rate of \$18.00 per hour. Variable overhead would be \$4.60 per ice maker. Fixed overhead, which would be incurred under either decision alternative, would be \$32,420 a year for depreciation and \$234,000 a year for other costs. Production and usage are estimated at 75,000 ice makers a year. (Assume that any idle equipment cannot be used for any other purpose.)

Required

1. Prepare an incremental analysis to determine whether the ice makers should be made within the company or purchased from the outside supplier at the higher price.
2. Compute the variable unit cost to (a) make one ice maker and (b) buy one ice maker.

L03 Special Order Decision

P 2. On March 26, Sinker Industries received a special order request for 120 ten-foot aluminum fishing boats. Operating on a fiscal year ending May 31, the company already has orders that will allow it to produce at budget levels for the period. However, extra capacity exists to produce the 120 additional boats.

The terms of the special order call for a selling price of \$675 per boat, and the customer will pay all shipping costs. No sales personnel were involved in soliciting the order.

The ten-foot fishing boat has the following cost estimates: direct materials, aluminum, two 4' × 8' sheets at \$155 per sheet; direct labor, 14 hours at \$15.00 per hour; variable overhead, \$7.25 per direct labor hour; fixed overhead, \$4.50 per direct labor hour; variable selling expenses, \$46.50 per boat; and variable shipping expenses, \$57.50 per boat.

Required

1. Prepare an analysis for the management of Sinker Industries to use in deciding whether to accept or reject the special order. What decision should be made?
2. To make an \$8,000 profit on this order, what would be the lowest possible price that Sinker Industries could charge per boat?

L04 Segment Profitability Decision

P 3. Sports, Inc., is a nationwide distributor of sporting equipment. The corporate president, Wesley Coldwell, is dissatisfied with corporate operating results, particularly those of the Spring Branch, and has asked the controller for more information. The controller prepared the following segmented income statement (in thousands of dollars) for the Spring Branch:

Sports, Inc., Spring Branch Segmented Income Statement For the Year Ended December 31 (Amounts in Thousands)				
	Football Line	Baseball Line	Basketball Line	Spring Branch
Sales	\$3,500	\$2,500	\$2,059	\$8,059
Less variable costs	<u>2,900</u>	<u>2,395</u>	<u>1,800</u>	<u>7,095</u>
Contribution margin	\$ 600	\$ 105	\$ 259	\$ 964
Less direct fixed costs	<u>300</u>	<u>150</u>	<u>159</u>	<u>609</u>
Segment margin	<u>\$ 300</u>	<u>(\$ 45)</u>	<u>\$ 100</u>	<u>\$ 355</u>
Less common fixed costs				<u>450</u>
Operating income (loss)				<u>(\$ 95)</u>

Coldwell is considering adding a new product line, Kite Surfing. The controller estimates that adding this line to the Spring Branch will increase sales by \$300,000, variable costs by \$150,000, and direct fixed costs by \$20,000. The new product line will have no effect on common fixed costs.

Required

1. How will operating income be affected if the Baseball line is dropped?
2. How will operating income be affected if the Baseball line is kept and a Kite Surfing line is added?

Manager insight ►

- If the Baseball line is dropped and the Kite Surfing line is added, sales of the Football line will decrease by 10 percent and sales of the Basketball line will decrease by 5 percent. How will those changes affect operating income?
- What decision do you recommend? Explain.

L05 Sales Mix Decision

P 4. Management at Generic Chemical Company is evaluating its product mix in an attempt to maximize profits. For the past two years, Generic has produced four products, and all have large markets in which to expand market share. Heinz Bexer, Generic's controller, has gathered data from current operations and wants you to analyze them for him. Sales and operating data are as follows:

	Product AZ1	Product BY7	Product CX5	Product DW9
Variable production costs	\$71,000	\$91,000	\$91,920	\$97,440
Variable selling costs	\$10,200	\$5,400	\$12,480	\$30,160
Fixed production costs	\$20,400	\$21,600	\$29,120	\$18,480
Fixed administrative costs	\$3,400	\$5,400	\$6,240	\$10,080
Total sales	\$122,000	\$136,000	\$156,400	\$161,200
Units produced and sold	85,000	45,000	26,000	14,000
Machine hours used*	17,000	18,000	20,800	16,800

*Generic's scarce resource, machine hours, is being used to full capacity.

Required

- Compute the machine hours needed to produce one unit of each product.
- Determine the contribution margin per machine hour for each product.
- Which product line(s) should be targeted for market share expansion?

L06 Sell or Process-Further Decision

P 5. Bagels, Inc., produces and sells 20 types of bagels by the dozen. Bagels are priced at \$6.00 per dozen (or \$0.50 each) and cost \$0.20 per unit to produce. The company is considering processing the bagels further into two products: bagels with cream cheese and bagel sandwiches. It would cost an additional \$0.50 per unit to produce bagels with cream cheese, and the new selling price would be \$2.50 each. It would cost an additional \$1.00 per sandwich to produce bagel sandwiches, and the new selling price would be \$3.50 each.

Required

- Identify the relevant per unit costs and revenues for the alternatives. Are there any sunk costs?
- Based on the information in requirement 1, should Bagels, Inc., expand its product offerings?
- Suppose that Bagels, Inc., did expand its product line to include bagels with cream cheese and bagel sandwiches. Based on customer feedback, the company determined that it could further process those two products into bagels with cream cheese and fruit and bagel sandwiches with cheese. The company's accountant compiled the following information:

Product (per unit)	Sales Revenue if Sold with No Further Processing	Sales Revenue if Processed Further	Additional Processing Costs
Bagels with cream cheese	\$2.50	\$3.50	Fruit: \$1.00
Bagel sandwiches	\$3.50	\$4.50	Cheese: \$0.50

Perform an incremental analysis to determine if Bagels, Inc., should process its products further. Explain your findings.

Alternate Problems

L02 Outsourcing Decision

P 6. Three Brothers Restaurant purchases cheesecakes and offers them as dessert items on its menu. The cheesecakes cost \$24 each, and a cake contains 8 pieces. The supplier recently gave advance notice that the price will rise by 20 percent immediately. Three Brothers Restaurant has idle equipment that with only a few minor changes could be used to produce similar cheesecakes.

Cost estimates have been prepared under the assumption that the company could make the product itself. Direct materials would cost \$7.00 per cheesecake. Direct labor required would be 0.5 hour per cheesecake at a labor rate of \$24.00 per hour. Variable overhead would be \$9.00 per cheesecake. Fixed overhead, which would be incurred under either decision alternative, would be \$35,200 a year for depreciation and \$230,000 a year for other costs. Production and usage are estimated at 3,600 cheesecakes a year. (Assume that any idle equipment cannot be used for any other purpose.)

Required

1. Prepare an incremental analysis to determine whether the cheesecakes should be made within the company or purchased from the outside supplier at the higher price.
2. Compute the variable unit cost to (a) make one cheesecake and (b) buy one cheesecake.

L03 Special Order Decision

P 7. Keystone Resorts, Ltd., has approached Crystal Printers, Inc., with a special order to produce 300,000 two-page brochures. Most of Crystal's work consists of recurring short-run orders. Keystone Resorts is offering a one-time order, and Crystal has the capacity to handle the order over a two-month period.

The management of Keystone Resorts has stated that the company would be unwilling to pay more than \$48 per 1,000 brochures. Crystal Printers' controller assembled the following cost data for this decision analysis: Direct materials (paper) would be \$26.80 per 1,000 brochures; direct labor costs would be \$6.80 per 1,000 brochures; direct materials (ink) would be \$4.40 per 1,000 brochures; variable production overhead would be \$6.20 per 1,000 brochures; machine maintenance (fixed cost) is \$1.00 per direct labor dollar. Other fixed production overhead amounts to \$2.40 per direct labor dollar. Variable packing costs would be \$4.30 per 1,000 brochures. Also, the share of general and administrative expenses (fixed costs) to be allocated would be \$5.25 per direct labor dollar.

Required

1. Prepare an analysis for Crystal Printers' management to use in deciding whether to accept or reject Keystone Resorts' offer. What decision should be made?
2. What is the lowest possible price Crystal Printers can charge per thousand and still make a \$6,000 profit on the order?

L04 Decision to Eliminate an Unprofitable Product

P 8. Seven months ago, Naib Publishing Company published its first book (Book N). Since then, Naib has added four more books to its product list (Books S, Q, X, and H). Management is considering proposals for three more new books, but editorial capacity limits the company to producing only seven books annually. Before deciding

which of the proposed books to publish, management wants you to evaluate the performance of its existing book list. Recent revenue and cost data are as follows:

Naib Publishing Company Product Profit and Loss Summary For the Year Ended December 31						
	Book N	Book S	Book Q	Book X	Book H	Company Totals
Sales	\$813,800	\$782,000	\$634,200	\$944,100	\$707,000	\$3,881,100
Less variable costs						
Materials and binding	\$325,520	\$312,800	\$190,260	\$283,230	\$212,100	\$1,323,910
Editorial services	71,380	88,200	73,420	57,205	80,700	370,905
Author royalties	130,208	125,120	101,472	151,056	113,120	620,976
Sales commissions	162,760	156,400	95,130	141,615	141,400	697,305
Other selling costs	50,682	44,740	21,708	18,334	60,700	196,164
Total variable costs	<u>\$740,550</u>	<u>\$727,260</u>	<u>\$481,990</u>	<u>\$651,440</u>	<u>\$608,020</u>	<u>\$3,209,260</u>
Contribution margin	\$ 73,250	\$ 54,740	\$152,210	\$292,660	\$ 98,980	\$ 671,840
Less total fixed costs	<u>97,250</u>	<u>81,240</u>	<u>89,610</u>	<u>100,460</u>	<u>82,680</u>	<u>451,240</u>
Operating income loss	<u>(\$ 24,000)</u>	<u>(\$ 26,500)</u>	<u>\$ 62,600</u>	<u>\$192,200</u>	<u>\$ 16,300</u>	<u>\$ 220,600</u>
Direct fixed costs included in total fixed costs above	<u>\$ 51,200</u>	<u>\$ 65,100</u>	<u>\$ 49,400</u>	<u>\$ 69,100</u>	<u>\$ 58,800</u>	<u>\$ 293,600</u>

Projected data for the three proposed new books are as follows: Book P, sales, \$450,000, and contribution margin, \$45,000; Book T, sales, \$725,000, and contribution margin, (\$25,200); Book R, sales, \$913,200, and contribution margin, \$115,500. Projected direct fixed costs are Book P, \$5,000; Book T, \$6,000; Book R, \$40,000.

Required

- Analyze the performance of the five books that the company is currently publishing.
- Should Naib Publishing Company eliminate any of its present products? If so, which one(s)?
- Identify the new books you would use to replace those eliminated. Justify your answer.

L05 Sales Mix Decision

P 9. Dr. Massy, who specializes in internal medicine, wants to analyze his sales mix to find out how the time of his physician assistant, Consuela Ortiz, can be used to generate the highest operating income.

Ortiz sees patients in Dr. Massy's office, consults with patients over the telephone, and conducts a daily weight-loss support group attended by up to 50 patients. Statistics for the three services are as follows:

	Office Visits	Phone Calls	Weight-Loss Support Group
Maximum number of patient billings per day	20	40	50
Hours per billing	0.25	0.10	1.0
Billing rate	\$50	\$25	\$10
Variable costs	\$25	\$12	\$5

Ortiz works seven hours a day.

Required

1. Determine the best sales mix. Rank the services offered in order of their profitability.
2. Based on the ranking in requirement 1, how much time should Ortiz spend on each service in a day? (**Hint:** Remember to consider the maximum number of patient billings per day.) What would be the daily total contribution margin generated by Ortiz?
3. Dr. Massy knows that the daily 60-minute meeting of the weight-loss support group has 50 patients and should continue to be offered. If the new ranking for the services is (1) weight-loss support group, (2) phone calls, and (3) office visits, how much time should Ortiz spend on each service in a day? What would be the total contribution margin generated by Ortiz, assuming the weight-loss support group has the maximum number of patient billings?
4. Which ranking would you recommend? What additional amount of total contribution margin would be generated if your recommendation were to be accepted?

Manager insight ►

L06 Sell or Process-Further Decision

P 10. Marketeers, Inc., developed a promotional program for a large shopping center in Sunset Living, Arizona, a few years ago. Having invested \$360,000 in developing the original promotion campaign, the firm is ready to present its client with an add-on contract offer that includes the original promotion areas of (1) a TV advertising campaign, (2) a series of brochures for mass mailing, and (3) a special rotating BIG SALE schedule for 10 of the 28 tenants in the shopping center. Presented below are the revenue terms from the original contract with the shopping center and the offer for the add-on contract, which extends the original contract terms.

	Original Contract Terms	Extended Contract Including Add-On Terms
TV advertising campaign	\$520,000	\$ 580,000
Brochure series	210,000	230,000
Rotating BIG SALE schedule	170,000	190,000
Totals	<u>\$900,000</u>	<u>\$1,000,000</u>

Marketeers, Inc., estimates that the following additional costs will be incurred by extending the contract:

	TV Campaign	Brochures	BIG SALE Schedule
Direct labor	\$30,000	\$ 9,000	\$7,000
Variable overhead costs	22,000	14,000	6,000
Fixed overhead costs*	12,000	4,000	2,000

*80 percent are direct fixed costs applied to this contract.

Required

1. Compute the costs that will be incurred for each part of the add-on portion of the contract.
2. Should Marketeers, Inc., offer the add-on contract, or should it ask for a final settlement check based on the original contract only? Defend your answer.
3. If management of the shopping center indicates that the terms of the add-on contract are negotiable, how should Marketeers, Inc., respond?

Manager insight ►

Manager insight ►

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 Defining and Identifying Relevant Information

C 1. Bob's Burgers is in the fast-food restaurant business. One component of its marketing strategy is to increase sales by expanding in foreign markets. It uses both financial and nonfinancial quantitative and qualitative information when deciding whether to open restaurants abroad. Bob's decided to open a restaurant in Prague (Czech Republic) five years ago. The following information helped the managers in making that decision:

Financial Quantitative Information

Operating information

Estimated food, labor, and other operating costs (e.g., taxes, insurance, utilities, and supplies)

Estimated selling price for each food item

Capital investment information

Cost of land, building, equipment, and furniture

Financing options and amounts

Nonfinancial Quantitative Information

Estimated daily number of customers, hamburgers to be sold, and number of employees

High-traffic time periods

Income of people living in the area

Ratio of population to number of restaurants in the market area

Traffic counts in front of similar restaurants in the area

Qualitative Information

Government regulations, taxes, duties, tariffs, political involvement in business operations

Property ownership restrictions

Site visibility

Accessibility of store location

Training process for local managers

Hiring process for employees

Local customs and practices

Bob's Burgers has hired you as a consultant and given you an income statement comparing the operating incomes of its five restaurants in Eastern Europe. You have noticed that the Prague location is operating at a loss (including unallocated fixed costs) and must decide whether to recommend closing that restaurant.

Review the information used in making the decision to open the restaurant. Identify the types of information that would also be relevant in deciding whether to close the restaurant. What period or periods of time should be reviewed in making your decision? What additional information would be relevant in making your decision?

LO1 Identifying Relevant Decision Information

C 2. Select two destinations for a one-week vacation, and gather information about them from brochures, magazines, travel agents, the Internet, and friends. Then list the relevant quantitative and qualitative information in

order of its importance to your decision. Analyze the information, and select a destination.

Which factors were most important to your decision? Why? Which were least important? Why? How would the process of identifying relevant information differ if the president of your company asked you to prepare a budget for the next training meeting, to be held at a location of your choice?

Your instructor will divide the class into groups and ask each group to discuss this case. One student from each group will summarize his or her group's findings and debrief the entire class.

L02 Ethics of a Make-or-Buy Decision

C 3. Tilly Issac is the assistant controller for Tagwell Corporation, a leading producer of home appliances. Her friend Zack Marsh is the supervisor of the firm's Cookware Department. Marsh has the authority to decide whether parts are purchased from outside vendors or manufactured in his department. Issac recently conducted an internal audit of the parts being manufactured in the Cookware Department, including a comparison of the prices currently charged by vendors for similar parts. She found more than a dozen parts that could be purchased for less than they cost the company to produce. When she approached Marsh about the situation, he replied that if those parts were purchased from outside vendors, two automated machines would be idle for several hours a week. Increased machine idle time would have a negative effect on his performance evaluation and could reduce his yearly bonus. He reminded Issac that he was in charge of the decision to make or purchase those parts and asked her not to pursue the matter any further.

What should Issac do in this situation? Discuss her options.

L03 Special Order Decision

C 4. Metallica Can Opener Company is a subsidiary of Maltz Appliances, Inc. The can opener that Metallica produces is in strong demand. Sales this year are expected to be 1,000,000 units. Full plant capacity is 1,150,000 units, but 1,000,000 units are considered normal capacity for the current year. The following unit price and cost breakdown is applicable:

	Per Unit
Sales price	<u>\$22.50</u>
Less manufacturing costs	
Direct materials	\$ 6.00
Direct labor	2.50
Overhead, variable	3.50
Overhead, fixed	<u>1.50</u>
Total manufacturing costs	<u>\$13.50</u>
Gross margin	<u>\$ 9.00</u>
Less selling and administrative expenses	
Selling, variable	\$ 1.50
Selling, fixed	1.00
Administrative, fixed	1.25
Packaging, variable*	<u>0.75</u>
Total selling and administrative expenses	<u>\$ 4.50</u>
Operating income	<u><u>\$ 4.50</u></u>

*Three types of packaging are available: deluxe, \$0.75 per unit; plain, \$0.50 per unit; and bulk pack, \$0.25 per unit.

During November, the company received three requests for special orders from large chain-store companies. Those orders are not part of the budgeted 1,000,000 units for this year, but company officials think that sufficient capacity exists for one order to be accepted. Orders received and their terms are as follows: Order 1, 75,000 can openers @ \$20.00 per unit, deluxe packaging; Order 2, 90,000 can openers @ \$18.00 per unit, plain packaging; Order 3, 125,000 can openers @ \$15.75 per unit, bulk packaging.

Because the orders were placed directly with company officials, no variable selling costs will be incurred.

1. Analyze the profitability of each of the three special orders.
2. Which special order should be accepted?

L04 Decision to Add a New Department

C 5. The management at Transco Company is considering a proposal to install a third production department in its factory building. With the company's existing production setup, direct materials are processed through the Mixing Department to produce Materials A and B in equal proportions. The Shaping Department then processes Material A to yield Product C. Material B is sold as is at \$20.25 per pound. Product C has a selling price of \$100.00 per pound. There is a proposal to add a Baking Department to process Material B into Product D. It is expected that any quantity of Product D can be sold for \$30.00 per pound.

Costs per pound under this proposal appear at the top of the next page.

	Mixing Department (Materials A and B)	Shaping Department (Product C)	Baking Department (Product D)
Costs from Mixing Department	—	\$52.80	\$13.20
Direct materials	\$20.00	—	—
Direct labor	6.00	9.00	3.50
Variable overhead	4.00	8.00	4.00
Fixed overhead			
Traceable (direct, avoidable)	2.25	2.25	1.80
Allocated (common, unavoidable)	0.75	0.75	0.75
	<u>\$33.00</u>	<u>\$72.80</u>	<u>\$23.25</u>

1. If (a) sales and production levels are expected to remain constant in the foreseeable future and (b) there are no foreseeable alternative uses for the factory space, should Transco Company add a Baking Department and produce Product D, if 100,000 pounds of D can be sold? Show calculations of incremental revenues and costs to support your answer.
2. List at least two qualitative reasons why Transco Company may not want to install a Baking Department and produce Product D, even if this decision appears profitable.
3. List at least two qualitative reasons why Transco Company may want to install a Baking Department and produce Product D, even if it appears that this decision is unprofitable. (CMA adapted)

LO3 LO4 Cookie Company (Continuing Case)

LO6 C6. As the president of your cookie company, you are interested in how public companies with a segment that includes cookies report their operating results. Because public companies are required to report on their segments, it is possible to evaluate the performance of comparable segments of different companies.

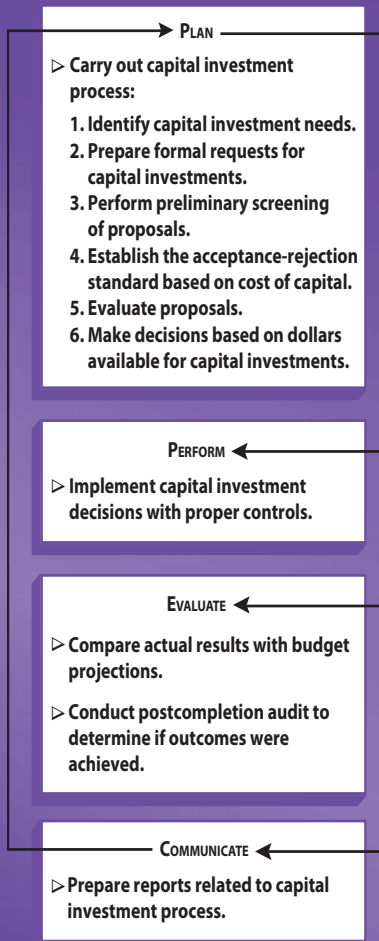
Access the website of **Kraft Foods, Inc.**, which markets Nabisco cookies (www.kraftfoodscompany.com/About), and the website of **Kellogg Company**, which markets Keebler cookies (www2.kelloggs.com). Find information about these companies' major segments. Which segments are comparable, and which are not comparable? Which segments of these companies do you think include their brand of cookies?

CHAPTER

11

Capital Investment Analysis

The Management Process



Managers use capital investment analysis to make long-term decisions that impact the business.

When deciding when and how much to spend on expensive, long-term projects, such as the construction of a new building or the installation of a new production system, managers apply capital investment analysis to ensure that they use resources wisely and that their choices make the maximum contribution to future profits. This chapter explains the net present value method and other methods of capital investment analysis that managers use when making decisions about long-term capital investments.

LEARNING OBJECTIVES

- L01** Define *capital investment analysis*, state the purpose of the minimum rate of return, and identify the methods used to arrive at that rate. (pp. 434–439)
- L02** Identify the types of projected costs and revenues used to evaluate alternatives for capital investment. (pp. 439–442)
- L03** Apply the concept of the time value of money. (pp. 442–446)
- L04** Analyze capital investment proposals using the net present value method. (pp. 446–448)
- L05** Analyze capital investment proposals using the payback period method and the accounting rate-of-return method. (pp. 449–452)

DECISION POINT ► **A MANAGER'S FOCUS AIR PRODUCTS AND CHEMICALS INC.**

Air Products and Chemicals Inc. is an industrial producer of gases that are piped directly into steel mills and other factories; it has many small gas plants located near its customers. What makes Air Products and Chemicals competitive is its use of “lights-out” systems, which are unattended operations with remote operator access. These systems minimize on-site labor by having regional operators remotely monitor several gas plants from a computer at their homes. If a problem occurs with a machine, an operator can repair it remotely or visit the plant.

Air Products and Chemicals is not alone in turning on-site labor’s lights off. Using systems that link machines to the Internet so that managers can monitor operations at any time and from anywhere is common not only in industries that produce identical products in high volume, but also when monitoring cellphone tower operations or vending machines. Automated systems of this kind are expensive, and managers must carefully weigh the risks involved in investing in them.

- Why are capital investment decisions critical for a company like Air Products and Chemicals Inc.?
- In evaluating capital investment alternatives, how can managers at Air Products and Chemicals Inc. ensure a wise allocation of resources and minimize the risks involved in capital investments?



The Capital Investment Process

LO1 Define *capital investment analysis*, state the purpose of the minimum rate of return, and identify the methods used to arrive at that rate.

Study Note

Capital investment analysis is a decision process for the purchase of capital facilities, such as buildings and equipment.

Among the most significant decisions that management must make are **capital investment decisions**, which are decisions about when and how much to spend on capital facilities and other long-term projects. Capital facilities and projects may include machinery, systems, or processes; new buildings or additions or renovations to existing buildings; entire new divisions or product lines; and distribution and software systems. For example, **Air Products and Chemicals Inc.** will make decisions about installing new equipment, replacing old equipment, expanding service by renovating or adding to existing equipment, buying a building, or acquiring another company.

Capital facilities and projects are expensive. A new factory or production system may cost millions of dollars and require several years to complete. Managers must make capital investment decisions carefully so that they select the alternatives that will contribute the most to future profits.

Capital Investment Analysis

Capital investment analysis, or *capital budgeting*, is the process of making decisions about capital investments. It consists of identifying the need for a capital investment, analyzing courses of action to meet that need, preparing reports for managers, choosing the best alternative, and allocating funds among competing needs. Every part of the organization participates in this process.

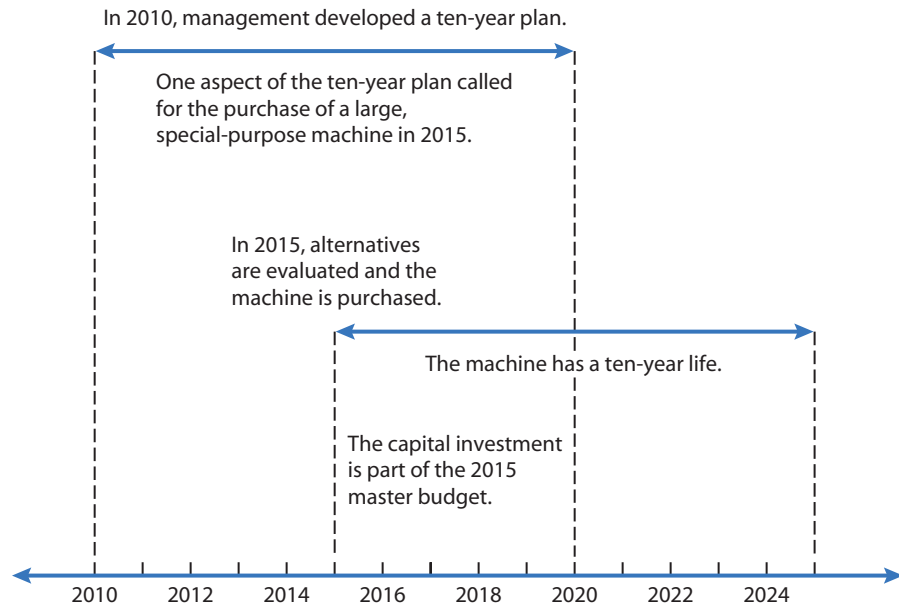
- ▶ Financial analysts supply a target cost of capital or desired rate of return and an estimate of how much money can be spent annually on capital facilities.
- ▶ Marketing specialists predict sales trends and new product demands, which help in determining which operations need expansion or new equipment.
- ▶ Managers at all levels help identify facility needs and often prepare preliminary cost estimates for the desired capital investment.
- ▶ All then work together to implement the project selected and to keep the results within revenue and cost estimates.

The capital investment process involves the evaluation of alternative proposals for large capital investments, including considerations for financing the projects. Capital investment analyses affect both short-term and long-term planning. Figure 11-1 illustrates the time span of the capital expenditure planning process. Most companies have a long-term plan—that is, a projection of operations for the next five or ten years. Large capital investments should be an integral part of that plan. Anticipated additions or changes to product lines, replacements of equipment, and acquisitions of other companies are examples of items to be included in long-term capital investment plans.

Capital Budgets and Master Budgets One element of budgeting is a capital investment budget. The capital investment budget fits into both the long-term planning process and the capital investment process. Long-term plans are not very specific; they are expressed in broad, goal-oriented terms. Each annual budget must help accomplish the organization's long-term goals. Look again at Figure 11-1. Suppose that in 2015 Neighborhood Communications, a lights-out user like **Air Products and Chemicals**, plans to build a special-purpose cell phone tower.

- ▶ When the ten-year capital budget plan was developed, it included only a broad statement about a plan to purchase the machine. Nothing was specified about the cost of the machine or the anticipated operating details and costs.

FIGURE 11-1
Time Span of the Capital Investment
Planning Process



- ▶ Those details are contained in the annual master budget for 2015, and it is in 2015 that the capital investment analysis will occur.

So, although capital investment decisions that will affect the company for many years are discussed and estimates of future revenues and expenditures are made when the long-term plan is first developed, the capital investment analysis is performed in the period in which the expenditure will be made. This point is important to the understanding of capital investment analysis.

Capital Investment Analysis in the Management Process

Managers pay close attention to capital investments throughout the management process, as illustrated in the sidebar on the first page of this chapter. However, the greatest portion of capital investment analysis takes place when they plan. Each decision made about a capital investment is vitally important because it involves a large amount of money and commits a company to a course of action for years to come. For example, **Air Products and Chemicals** and Neighborhood Communications must make capital investment decisions that fit into their strategic plans. A series of poor decisions about capital investments can cause a company to fail.

To ensure high-quality capital investment decisions, managers follow six key steps when they plan.

Study Note

The six steps of capital investment analysis are performed for both long-term and short-term planning purposes.

Step 1. Identification of Capital Investment Needs Identifying the need for a new capital investment is the starting point of capital investment analysis. Managers identify capital investment opportunities from past sales experience, changes in sources and quality of materials, employees' suggestions, production bottlenecks caused by obsolete equipment, new production or distribution methods, or customer complaints. In addition, capital investment needs are identified through proposals to:

- ▶ Add new products to the product line.
- ▶ Expand capacity in existing product lines.

- ▶ Reduce production costs of existing products without altering operating levels.
- ▶ Automate existing production processes.

Step 2. *Formal Requests for Capital Investments* To enhance control over capital investments, managers prepare formal requests for new capital investments. Each request includes a complete description of the investment under review; the reasons a new investment is needed; the alternative means of satisfying the need; the timing, estimated costs, and related cost savings of each alternative; and the investment's engineering specifications, if necessary.

Step 3. *Preliminary Screening* Organizations that have several branches and a highly developed system for capital investment analysis require that all proposals go through preliminary screening. The purpose of preliminary screening is to ensure that the only proposals to receive serious review are those that both meet company strategic goals and produce the minimum rate of return set by management.

Step 4. *Establishment of the Acceptance-Rejection Standard* To attract and maintain funding for capital investments, an organization establishes an acceptance-rejection standard. Such a standard may be expressed as a minimum rate of return or a minimum cash flow payback period. If the number of acceptable requests for capital investments exceeds the funds available for such investments, the proposals must be ranked according to their rates of return. Acceptance-rejection standards are used to identify projects that are expected to yield inadequate or marginal returns. They also identify proposed projects for which high product demand and high financial returns are expected. Cost of capital information is often used to establish minimum rates of return on investments. The development of such rates is discussed later in this chapter.

Step 5. *Evaluation of Proposals* Proposals are evaluated by verifying decision variables and applying established proposal evaluation methods. The key decision variables are (1) expected life, (2) estimated cash flow, and (3) investment cost. Each variable in a proposal should be checked for accuracy. Three commonly used methods of evaluating proposed capital investments are:

- ▶ Net present value method
- ▶ Payback period method
- ▶ Accounting rate-of-return method

Using one or more evaluation methods and the minimum acceptance-rejection standard, management evaluates all proposals. In addition to this quantitative analysis, management will also consider qualitative factors, such as availability and training of employees, competition, anticipated future technological improvements, and the proposal's impact on other company operations.

Step 6. *Capital Investment Decisions* The proposals that meet the standards of the evaluation process are given to the appropriate manager for final review. When deciding which requests to implement, the manager must consider the funds available for capital investments. The acceptable proposals are ranked in order of net present value, payback period, or rate of return,

and the highest-ranking proposals are funded first. Often there will not be enough money to fund all proposals. The final capital investment budget is then prepared by allocating funds to the selected proposals.

The Minimum Rate of Return on Investment

Most companies set a minimum rate of return, and any capital expenditure proposal that fails to produce that rate of return is automatically refused. The minimum rate of return is often referred to as a *hurdle rate* because it is the rate that must be exceeded, or hurdled. If none of the capital investment requests is expected to meet or exceed the minimum rate of return, or hurdle rate, all requests will be turned down.

Organizations set a minimum rate of return to guard their profitability. If the return from a capital investment falls below the minimum rate of return, the funds can be used more profitably in another part of the organization. Projects that produce poor returns will ultimately have a negative effect on an organization's profitability.

Cost of Capital

Determining a minimum rate of return is not a simple task. The most widely used measure is the cost of capital. The **cost of capital** is the weighted-average rate of return that a company must pay to its long-term creditors and shareholders for the use of their funds. The components of cost of capital are the cost of debt, the cost of preferred stock, the cost of common stock, and the cost of retained earnings. Sophisticated methods may be used to determine these costs. However, in this discussion, we use a simplified definition of each cost:

- ▶ The cost of debt is the after-tax interest on the debt (interest times 1 minus the tax rate). The after-tax amount is used because the interest is tax-deductible.
- ▶ The cost of preferred stock is the full dividend rate because dividends are not tax-deductible.
- ▶ The cost of equity capital (common stock and retained earnings) is the return required by investors in the company.

Cost of Capital Calculation The cost of capital is computed in four steps:

1. Identify the cost of each source of capital.
2. Compute the proportion (percentage) of the organization's total amount of debt and equity that each source of capital represents.

Study Note

Depending on the mixture of sources of capital, a company's cost of capital will vary.



FOCUS ON BUSINESS PRACTICE

Why Look Beyond the Cost of a Capital Investment?

Cost should not be the only factor when making a capital investment decision. International trade and logistics can also be very important, as **Koss Corporation**, a maker of high-fidelity headphones located in Milwaukee, Wisconsin, learned after moving much of its production to China, where costs were low. The move, however, caused a problem with making

timely deliveries to customers, and the just-in-time inventory philosophy was abandoned to avoid customer backorders and dissatisfaction. Now, finished products are stacked in the Milwaukee factory to ensure against dockworker strikes and missed deliveries. Looking beyond the numbers is thus an important consideration in capital investment decisions.¹

3. Multiply each source's cost by its proportion of the capital.
4. Total the weighted costs computed in Step 3.

For example, suppose Neighborhood Communications' financing structure is as follows:

<i>Cost of Capital</i>	<i>Source of Capital</i>	<i>Amount</i>	<i>Proportion of Capital</i>
6%	Debt financing	\$150,000	30%
8	Preferred stock	50,000	10
12	Common stock	200,000	40
12	Retained earnings	100,000	20
	Totals	<u>\$500,000</u>	<u>100%</u>

The cost of capital of 9.8 percent would be computed as follows:

<i>Source of Capital</i>	<i>Cost of Capital</i>	×	<i>Proportion of Capital</i>	=	<i>Weighted Cost</i>
Debt financing	6%		30%		0.018
Preferred stock	8		10		0.008
Common stock	12		40		0.048
Retained earnings	12		20		0.024
Cost of capital					<u>0.098</u>

Other Measures for Determining Minimum Rate of Return

If cost of capital information is unavailable, management can use one of three less accurate but still useful amounts as the minimum rate of return.

- ▶ The first is the average total corporate return on investment. This measure is based on the notion that any capital investment that produces a lower return than the rate that the company has earned historically will negatively affect investors' perception of the firm's future market value.
- ▶ A second method is to use the industry's average cost of capital. Most sizable industry associations supply such information.
- ▶ As a last resort, a company might use the current bank lending rate. But because most companies are financed by both debt and equity, the bank lending rate seldom reflects an accurate rate of return.

Ranking Capital Investment Proposals

The requests for capital investments that a company receives usually exceed the funds available for capital investments. Even after management evaluates and selects proposals under the minimum acceptance-rejection standard, there are often too many proposals to fund adequately. At that point, managers must rank the proposals according to their rates of return, or profitability, and begin a second selection process.

Suppose that Neighborhood Communications has \$4,500,000 to spend this year for capital improvements and that five acceptable proposals are competing for those funds. The company's current minimum rate of return is 18 percent, and it is considering the following proposals:

<i>Project</i>	<i>Rate of Return</i>	<i>Capital Investment</i>	<i>Cumulative Investment</i>
A	32%	\$1,460,000	\$1,460,000
B	30	1,890,000	3,350,000
C	28	460,000	3,810,000
D	24	840,000	4,650,000
E	22	580,000	5,230,000
Total		<u>\$5,230,000</u>	

The proposals are listed in the order of their rates of return. As you can see, Projects A, B, and C have the highest rates of return and together will cost a total of \$3,810,000. That leaves \$690,000 in capital funds for other projects. Project D should be examined first to see if it could be implemented for \$150,000 less. If not, then Project E should be selected. The selection of Projects A, B, C, and E means that \$110,000 in capital funds will be uncommitted for the year.

STOP & APPLY >

Sample Industries is considering investing \$20 million in a plant expansion. Management needs to know the average cost of capital to use in evaluating this capital investment decision. The company's capital structure consists of \$2,000,000 of debt at 6 percent interest and \$3,000,000 of stockholders' equity at 2 percent. What is Sample Industries' average cost of capital?

SOLUTION

The company's average cost of capital is 3.6 percent, which is computed as follows:

Source of Capital	Amount	Proportion of Capital		Cost of Capital		Weighted Cost
Debt	\$20,000,000	40%	×	6%	=	0.024
Equity	30,000,000	60	×	2	=	0.012
Total	<u>\$50,000,000</u>	<u>100%</u>				<u>0.036</u>

Measures Used in Capital Investment Analysis

L02 Identify the types of projected costs and revenues used to evaluate alternatives for capital investment.

When evaluating a proposed capital investment, managers must predict how the new asset will perform and how it will benefit the company. Various measures are used to estimate the benefits to be derived from a capital investment.

Expected Benefits from a Capital Investment

Each capital investment analysis must include a measure of the expected benefit from the investment project. The measure of expected benefit depends on the method of analyzing capital investment alternatives.

Net Income One possible measure is net income, calculated in the usual way. Managers determine increases in net income resulting from the capital investment for each alternative.

Net Cash Flows and Cost Savings A more widely used measure of expected benefit is projected cash flows. **Net cash inflows** are the balance of increases in projected cash receipts over increases in projected cash payments resulting from a capital investment. In some cases, equipment replacement decisions involve situations in which revenues are the same among alternatives. In such cases, **cost savings** measure the benefits, such as reduced costs, from proposed capital investments.

Either net cash inflows or cost savings can be used as the basis for an evaluation, but the two measures should not be confused.

- ▶ If the analysis involves cash receipts, net cash inflows are used.
- ▶ If the analysis involves only cash outlays, cost savings are used.

Managers must measure and evaluate all the investment alternatives consistently.

Equal Versus Unequal Cash Flows

Projected cash flows may be the same for each year of an asset's life, or they may vary from year to year. Unequal annual cash flows are common and must be analyzed for each year of an asset's life. Proposed projects with equal annual cash flows require less detailed analysis. Both a project with equal cash flows and one with unequal cash flows are illustrated and explained later in this chapter.

Carrying Value of Assets

Carrying value is the undepreciated portion of the original cost of a fixed asset—that is, the asset's cost less its accumulated depreciation. Carrying value is also referred to as *book value*. When a decision to replace an asset is being evaluated, the carrying value of the old asset is irrelevant because it is a past, or historical, cost and will not be altered by the decision. Net proceeds from the asset's sale or disposal are relevant, however, because the proceeds affect cash flows and may differ for each alternative.

Depreciation Expense and Income Taxes

The techniques of capital investment analysis discussed in this chapter compare the relative benefits of proposed capital investments by measuring the cash receipts and payments for a facility or project. Income taxes alter the amount and timing of cash flows of projects under consideration by for-profit companies because corporate income tax rates vary and can change yearly. To assess the benefits of a capital project, a company must include the effects of taxes in its capital investment analyses. Depreciation expense is deductible when determining income taxes. (You may recall that the annual depreciation expense computation using the straight-line method is the asset's cost less its residual value, divided by the asset's useful life.) Thus, depreciation expense strongly influences the amount of income taxes that a company pays and can lead to significant tax savings.

To examine how taxes affect capital investment analysis, assume that Neighborhood Communications has a tax rate of 30 percent on taxable income. It is considering a capital project that will make the following annual contribution to operating income:

Cash revenues	\$400,000
Cash expenses	(200,000)
Depreciation	(100,000)
Operating income before income taxes	<u>\$100,000</u>
Income taxes at 30%	(30,000)
Operating income	<u><u>\$ 70,000</u></u>

The net cash inflows for this project can be determined in either of two ways:

1. Net cash inflows—receipts and disbursements	
Revenues (cash inflows)	\$400,000
Cash expenses (outflows)	(200,000)
Income taxes (outflows)	<u>(30,000)</u>
Net cash inflows	<u>\$170,000</u>
2. Net cash inflows—income adjustment procedure	
Income after income taxes	\$ 70,000
Add back noncash expenses (depreciation)	100,000
Less noncash revenues	<u>—</u>
Net cash inflows	<u>\$170,000</u>

In both computations, the net cash inflows are \$170,000, and the total effect of income taxes is to lower the net cash inflows by \$30,000.

Disposal or Residual Values

Proceeds from the sale of an old asset are current cash inflows and are relevant to evaluating a proposed capital investment. Projected disposal or residual values of replacement equipment are also relevant because they represent future cash inflows and usually differ among alternatives. Remember that the residual value, sometimes called the *disposal* or *salvage value*, of an asset will be received at the end of the asset's estimated life.

STOP & APPLY >

Sample Company has a tax rate of 25 percent on taxable income. It is considering a capital project that will make the following annual contribution to operating income:

Cash revenues	\$500,000
Cash expenses	(300,000)
Depreciation	<u>(150,000)</u>
Operating income before income taxes	\$ 50,000
Income taxes at 25%	<u>(12,500)</u>
Operating income	<u>\$ 37,500</u>

- Determine the net cash inflows for this project in two different ways. Are net cash flows the same under either approach?
- What is the impact of income taxes on net cash flows?

(continued)

SOLUTION

1. The net cash inflows for this project can be determined in two ways:

a. Net cash inflows—receipts and disbursements	
Revenues (cash inflows)	\$500,000
Cash expenses (outflows)	(300,000)
Income taxes (outflows)	(12,500)
Net cash inflows	<u>\$187,500</u>
b. Net cash inflows—income adjustment procedure	
Income after income taxes	\$ 37,500
Add back noncash expenses (depreciation)	150,000
Less noncash revenues	—
Net cash inflows	<u>\$187,500</u>

In both computations, the net cash inflows are \$187,500.

2. The total effect of income taxes is to lower the net cash inflows by \$12,500.

The Time Value of Money

LO3 Apply the concept of the time value of money.

An organization has many options for investing capital besides buying plant assets. Consequently, management expects a plant asset to yield a reasonable return during its useful life. A key question in capital investment analysis is how to measure the return on a plant asset. One way is to look at the cash flows that the asset will generate during its useful life. When an asset has a long useful life, management will usually analyze those cash flows in terms of the time value of money. The **time value of money** is the concept that cash flows of equal dollar amounts separated by an interval of time have different present values because of the effect of compound interest. The notions of interest, present value, future value, and present value of an ordinary annuity are all related to the time value of money.

Study Note

Interest is a cost associated with the passage of time, whether or not there is a stated interest rate.

Interest

Interest is the cost associated with the use of money for a specific period of time. Because interest is a cost associated with time and “time is money,” interest is an important consideration in any business decision.

- ▶ **Simple interest** is the interest cost for one or more periods when the amount on which the interest is computed stays the same from period to period.
- ▶ **Compound interest** is the interest cost for two or more periods when the amount on which interest is computed changes in each period to include all interest paid in previous periods. In other words, compound interest is interest earned on a principal sum that is increased at the end of each period by the interest for that period.

Example: Simple Interest You accept an 8 percent, \$30,000 note due in 90 days. How much will you receive in total when the note comes due? The formula for calculating simple interest is as follows:

$$\begin{aligned}
 \text{Interest Expense} &= \text{Principal} \times \text{Rate} \times \text{Time} \\
 &= \$30,000 \times 8/100 \times 90/360 \\
 &= \$600
 \end{aligned}$$

The total that you will receive is computed as follows:

$$\begin{aligned}\text{Total} &= \text{Principal} + \text{Interest} \\ &= \$30,000 + \$600 \\ &= \$30,600\end{aligned}$$

If the interest is paid and the note is renewed for an additional 90 days, the interest calculation will remain the same.

Example: Compound Interest You make a deposit of \$5,000 in a savings account that pays 6 percent interest. You expect to leave the principal and accumulated interest in the account for three years. What will be your account total at the end of three years? Assume that the interest is paid at the end of the year, that the interest is added to the principal at that time, and that this total in turn earns interest.

The amount at the end of three years is computed as follows:

(1) Year	(2) <i>Principal Amount at Beginning of Year</i>	(3) <i>Annual Amount of Interest (col. 2 × 0.06)</i>	(4) <i>Accumulated Amount at End of Year (col. 2 + col. 3)</i>
1	\$5,000.00	\$300.00	\$5,300.00
2	5,300.00	318.00	5,618.00
3	5,618.00	337.08	5,955.08

At the end of three years, you will have \$5,955.08 in your savings account. Note that the annual amount of interest increases each year by the interest rate times the interest of the previous year. For example, between year 1 and year 2, the interest increased by \$18 (\$318 – \$300), which exactly equals 6 percent times \$300.

Present Value

Suppose that you had the choice of receiving \$100 today or one year from today. Intuitively, you would choose to receive the \$100 today. Why? You know that if you have the \$100 today, you can put it in a savings account to earn interest, so that you will have more than \$100 a year from today.

► Therefore, we can say that an amount to be received in the future (future value) is not worth as much today as the same amount to be received today (present value) because of the cost associated with the passage of time.

Future value and present value are closely related. **Future value** is the amount that an investment will be worth at a future date if it is invested today at compound interest. **Present value** is the amount that must be invested today at a given rate of compound interest to produce a given future value.

Assume Neighborhood Communications needs \$1,000 one year from now. How much should it invest today to achieve that goal if the interest rate is 5 percent? The following equation can be used to answer that question:

$$\begin{aligned}\text{Present Value} \times (1.0 + \text{Interest Rate}) &= \text{Future Value} \\ \text{Present Value} \times 1.05 &= \$1,000.00 \\ \text{Present Value} &= \$1,000.00 \div 1.05 \\ \text{Present Value} &= \$952.38^*\end{aligned}$$

*Rounded.

Thus, to achieve a future value of \$1,000.00, a present value of \$952.38 must be invested. Interest of 5 percent on \$952.38 for one year equals \$47.62, and the two amounts added together equal \$1,000.00.

Present Value of a Single Sum Due in the Future

When more than one time period is involved, the calculation of present value is more complicated.

Assume Neighborhood Communications wants to be sure of having \$4,000 at the end of three years. How much must the company invest today in a 5 percent savings account to achieve that goal? By adapting the preceding equation, the present value of \$4,000 at compound interest of 5 percent for three years in the future may be computed as follows:

<i>Year</i>	<i>Amount at End of Year</i>	<i>Divide by</i>	<i>Present Value at Beginning of Year</i>
3	\$4,000.00	÷ 1.05 =	\$3,809.52
2	3,809.52	÷ 1.05 =	3,628.11
1	3,628.11	÷ 1.05 =	3,455.34

Neighborhood Communications must invest a present value of \$3,455.34 to achieve a future value of \$4,000 in three years.

This calculation is made easier by using the appropriate table from the appendix on present value tables. In Table 1, we look down the 5 percent column until we reach period 3. There we find the factor 0.864. Multiplied by \$1, this factor gives the present value of \$1 to be received three years from now at 5 percent interest. Thus, we solve the previous problem as follows:

$$\begin{aligned} \text{Future Value} \times \text{Present Value Factor} &= \text{Present Value} \\ \$4,000 \times 0.864 &= \$3,456 \end{aligned}$$

Except for a rounding difference of \$0.66, this gives the same result as the previous calculation.

Present Value of an Ordinary Annuity

It is often necessary to compute the present value of a series of receipts or payments. When we calculate the present value of equal amounts equally spaced over a period of time, we are computing the present value of an ordinary annuity. An



FOCUS ON BUSINESS PRACTICE

How Would You Decide Whether to Buy Rare Dinosaur Bones?

Not-for-profit organizations can use the techniques of capital investment analysis just as for-profit ones do. For example, the officers of the Field Museum in Chicago applied these techniques when they decided to bid at auction several years ago on the most complete skeleton of a *Tyrannosaurus rex* ever found. The museum bought the bones for \$8.2 million and spent another \$9 million to restore and install the dinosaur, named Sue. The museum projected that Sue would attract 1 million new visitors, who would

produce \$5 million in admissions and spend several more million dollars on food, gifts, and the like. After deducting operating costs, museum officials used discounted present values to calculate a return on investment of 10.5 percent. Given that the museum's cost of capital was 8.5 percent, Sue's purchase was considered a financial success. Sue has been extremely popular with the public and more than met the museum's attendance goals in the first year after installation.²

Study Note

The first payment of an ordinary annuity is always made at the end of the first year.

ordinary annuity is a series of equal payments or receipts that will begin one time period from the current date.

Suppose that Neighborhood Communications has sold a piece of property and is to receive \$15,000 in three equal annual cash payments of \$5,000, beginning one year from today. What is the present value of this sale, assuming a current interest rate of 5 percent?

This present value can be determined by calculating a separate present value for each of the three payments (using Table 1 in the appendix on present value tables) and summing the results, as follows:

<i>Future Cash Receipts (Annuity)</i>				<i>Present Value Factor at 5 Percent (from Table 1)</i>		<i>Present Value</i>
<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>				
\$5,000			×	0.952	=	\$ 4,760
	\$5,000		×	0.907	=	4,535
		\$5,000	×	0.864	=	4,320
Total Present Value						<u>\$13,615</u>

The present value of this sale is \$13,615. Thus, there is an implied interest cost (given the 5 percent rate) of \$1,385 associated with the payment plan that allows the purchaser to pay in three installments. We can calculate this present value more easily by using Table 2 in the appendix on present value tables. We look down the 5 percent column until we reach period 3. There we find the factor 2.723. That factor, when multiplied by \$1, gives the present value of a series of three \$1 payments, spaced one year apart, at compound interest of 5 percent. Thus, we solve the problem as follows:

$$\begin{array}{rcccccc} \text{Periodic Payment} & \times & \text{Present Value Factor} & = & \text{Present Value} \\ \$5,000 & \times & 2.723 & = & \$13,615 \end{array}$$

This result is the same as the one computed earlier.

To summarize the example, if Neighborhood Communications is willing to accept a 5 percent rate of return, management will be equally satisfied to receive a single cash payment of \$13,615 today or three equal annual cash payments of \$5,000 spread over the next three years.

STOP & APPLY >

For each of the following situations, identify the correct factor to use from Tables 1 or 2 in the appendix on present value tables. Also, compute the appropriate present value.

- Annual net cash inflows of \$35,000 for five years, discounted at 16 percent
- An amount of \$25,000 to be received at the end of ten years, discounted at 12 percent
- The amount of \$28,000 to be received at the end of two years, and \$15,000 to be received at the end of years 4, 5, and 6, discounted at 10 percent

(continued)

SOLUTION

1. From Table 2 in the appendix on present value tables:

$$\$35,000 \quad \times \quad 3.274 \quad = \quad \underline{\underline{\$114,590}}$$

2. From Table 1 in the appendix on present value tables:

$$\$25,000 \quad \times \quad 0.322 \quad = \quad \underline{\underline{\$ 8,050}}$$

3. From Table 1 in the appendix on present value tables:

$$\begin{array}{rclclcl} \$28,000 & \times & 0.826 & = & \$ 23,128 \\ \$15,000 & \times & 0.683 & = & 10,245 \\ \$15,000 & \times & 0.621 & = & 9,315 \\ \$15,000 & \times & 0.564 & = & 8,460 \\ \text{Total} & & & & \underline{\underline{\$ 51,148}} \end{array}$$

The Net Present Value Method

LO4 Analyze capital investment proposals using the net present value method.

Study Note

Because it is based on cash flow, the net present value method is widely used not only in business but also by individuals.

Study Note

If the net present value is zero, the investment will earn the minimum rate of return.

The **net present value method** evaluates a capital investment by discounting its future cash flows to their present values and subtracting the amount of the initial investment from their sum. All proposed capital investments are evaluated in the same way, and the projects with the highest net present value—the amount that exceeds the initial investment—are selected for implementation.

Advantages of the Net Present Value Method

A significant advantage of the net present value method is that it incorporates the time value of money into the analysis of proposed capital investments. Future cash inflows and outflows are discounted by the company's minimum rate of return to determine their present values. The minimum rate of return should at least equal the company's average cost of capital.

When dealing with the time value of money, use discounting to find the present value of an amount to be received in the future. To determine the present values of future amounts of money, use Tables 1 and 2 in the appendix on present value tables. Remember:

- ▶ Table 1 deals with a single payment or amount.
- ▶ Table 2 is used for a series of equal periodic amounts.

Tables 1 and 2 are used to discount each future cash inflow and cash outflow over the life of the asset to the present. If the net present value is positive (the total of the discounted net cash inflows exceeds the cash investment at the beginning), the rate of return on the investment will exceed the company's minimum rate of return, or hurdle rate, and the project can be accepted. Conversely, if the net present value is negative (the cash investment at the beginning exceeds the discounted net cash inflows), the return on the investment is less than the minimum rate of return and the project should be rejected. If the net present value is zero (if discounted cash inflows equal discounted cash outflows), the project meets the minimum rate of return and can be accepted.

The Net Present Value Method Illustrated

Suppose that Neighborhood Communications is considering the purchase of a new cell phone antenna that will boost the power of cell phone signals in the area.

Study Note

When using the net present value method, remember to consider the present value of the residual or disposal value.

The company's minimum rate of return is 16 percent. Management must decide between two models.

- ▶ Model M costs \$17,500 and will have an estimated residual value of \$2,000 after five years. It is projected to produce cash inflows of \$6,000, \$5,500, \$5,000, \$4,500, and \$4,000 during its five-year life.
- ▶ Model N costs \$21,000 and will have an estimated residual value of \$2,000. It is projected to produce cash inflows of \$6,000 per year for five years.

Because Model M is expected to produce unequal cash inflows, Table 1 in the appendix on present value tables is used to determine the present value of each cash inflow from each year of the machine's life. The net present value of Model M is determined as follows:

<i>Model M</i>			
<i>Year</i>	<i>Net Cash Inflows</i>	<i>16% Factor</i>	<i>Present Value</i>
1	\$6,000	0.862	\$ 5,172.00
2	5,500	0.743	4,086.50
3	5,000	0.641	3,205.00
4	4,500	0.552	2,484.00
5	4,000	0.476	1,904.00
Residual value	2,000	0.476	952.00
Total present value of cash inflows			<u>\$17,803.50</u>
Less purchase price of Model M			<u>17,500.00</u>
Net present value			<u>\$ 303.50</u>

All the factors for this analysis can be found in the column for 16 percent in Table 1. The factors are used to discount the individual cash flows, including the expected residual value, to the present. The amount of the investment in Model M is deducted from the total present value of the cash inflows to arrive at the net present value of \$303.50. Since the entire investment of \$17,500 in Model M is a cash outflow at the beginning—that is, at time zero—no discounting of the \$17,500 purchase price is necessary.

- ▶ Because the net present value is positive, the proposed investment in Model M will achieve at least the minimum rate of return.

Because Model N is expected to produce equal cash receipts in each year of its useful life, Table 2 in the appendix on present value tables is used to determine the combined present value of those future cash inflows. However, Table 1 is used to determine the present value of the machine's residual value because it represents a single payment, not an annuity. The net present value of Model N is calculated as follows:

<i>Model N</i>			
<i>Year</i>	<i>Net Cash Inflows</i>	<i>16% Factor</i>	<i>Present Value</i>
1–5	\$6,000	3.274	\$19,644.00
Residual value	2,000	0.476	952.00
Total present value of cash inflows			<u>\$20,596.00</u>
Less purchase price of Model N			<u>21,000.00</u>
Net present value			<u>(\$ 404.00)</u>



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What Is Total Cost of Ownership, and Why Is It Important?

The concept of total cost of ownership (TCO) was developed to determine the total lifetime costs of owning an information technology (IT) asset, such as a computer system. TCO includes both the direct and indirect costs associated with the acquisition, deployment, operation, support, and retirement of the asset. Today, TCO is the industry standard for evaluating and comparing the costs

associated with long-lived asset acquisitions. For example, if you buy a printer, TCO includes the direct costs of buying the printer, the annual supplies costs of ink and paper, and the indirect costs of maintaining it. Thus, the decision about which printer to buy is not based solely on the cost of the printer, but on all costs related to it over its useful lifetime.

Table 2 is used to determine the factor of 3.274 (found in the column for 16 percent and the row for five periods). Because the residual value is a single inflow in the fifth year, the factor of 0.476 must be taken from Table 1 (the column for 16 percent and the row for five periods). The result is a net present value of (\$404).

- ▶ Because the net present value is negative, the proposed investment in Model N will not achieve the minimum rate of return and should be rejected.

The two analyses show that Model M should be chosen because it has a positive net present value and would exceed the company's minimum rate of return. Model N should be rejected because it does not achieve the minimum rate of return. Model M is the better choice because it is expected to produce cash inflows sooner and will thus produce a proportionately greater present value.

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Sample Communications, Inc., is considering the purchase of a new piece of data transmission equipment. Estimated annual net cash inflows for the new equipment are \$575,000. The equipment costs \$2 million, has a five-year life, and will have no residual value at the end of the five years. The company's minimum rate of return is 12 percent. Compute the net present value of the equipment. Should the company purchase it?

SOLUTION

$$\begin{aligned} \text{Net Present Value} &= \text{Present Value of Future Net Cash Inflows} - \text{Cost of Equipment} \\ &= (\$575,000 \times 3.605^*) - \$2,000,000 \\ &= \$2,072,875 - \$2,000,000 \\ &= \$72,875 \end{aligned}$$

The solution is positive, so the company should purchase the equipment. A positive answer means that the investment will yield more than the minimum 12 percent return required by the company.

*From Table 2 in the appendix on present value tables.

Other Methods of Capital Investment Analysis

LO5 Analyze capital investment proposals using the payback period method and the accounting rate-of-return method.

Study Note

The payback period method measures the estimated length of time necessary to recover in cash the cost of an investment.

The net present value method is the best method for capital investment analysis. However, two other commonly used methods provide rough guides to evaluating capital investment proposals. These methods are the payback period method and the accounting rate-of-return method.

The Payback Period Method

Because cash is an essential measure of a business's health, many managers estimate the cash flow that an investment will generate. Their goal is to determine the minimum time it will take to recover the initial investment. If two investment alternatives are being studied, management should choose the investment that pays back its initial cost in the shorter time. That period of time is known as the payback period, and the method of evaluation is called the **payback period method**. Although the payback period method is simple to use, its use has declined because it does not consider the time value of money.

Payback Calculation The payback period is computed as follows:

$$\text{Payback Period} = \frac{\text{Cost of Investment}}{\text{Annual Net Cash Inflows}}$$

To apply the payback period method, suppose that Neighborhood Communications is interested in purchasing a new server that costs \$51,000 and has a residual value of \$3,000. Assume that estimates for the proposal include revenue increases of \$17,900 a year and operating cost increases of \$11,696 a year (including depreciation and taxes). To evaluate this proposed capital investment, use the following steps:

Step 1. Determine the cost of the investment. In the example, it is \$51,000.

Step 2. Determine the annual net cash inflows, which are the annual cash revenues minus the cash expenses.

- ▶ Eliminate the effects of all noncash revenue and expense items included in the analysis of net income to determine cash revenues and cash expenses.
- ▶ In this case, the only noncash expense or revenue is machine depreciation. To eliminate it from operating expenses, you must first calculate depreciation expense. To calculate this amount, you must know the asset's life and the depreciation method. Suppose that Neighborhood Communications uses the straight-line method of depreciation, and the new server will have a ten-year service life. The annual depreciation is computed using this information and the facts given earlier, as follows:

$$\begin{aligned} \text{Annual Depreciation} &= \frac{\text{Cost} - \text{Residual Value}}{\text{Years}} \\ &= \frac{\$51,000 - \$3,000}{10 \text{ Years}} \\ &= \$4,800 \text{ per Year} \end{aligned}$$

- ▶ Thus, cash expenses are equal to the operating cost of \$11,696 reduced by the depreciation expense of \$4,800, or \$6,896.
- ▶ The annual net cash inflows are \$11,004, or cash revenue increases of \$17,900 less cash expenses of \$6,896.

Study Note

In computing the payback period, depreciation is omitted because it is a noncash expense.

Step 3. Compute the payback period.

$$\begin{aligned}\text{Payback Period} &= \frac{\text{Cost of Machine}}{\text{Cash Revenue} - \text{Cash Expenses}} \\ &= \frac{\$51,000}{\$17,900 - (\$11,696 - \$4,800)} \\ &= \frac{\$51,000}{\$11,004} \\ &= 4.6 \text{ Years}^*\end{aligned}$$

*Rounded.

If the company's desired payback period is five years or less, this proposal would be approved.

Unequal Annual Net Cash Inflows If a proposed capital investment has unequal annual net cash inflows, the payback period is determined by subtracting each annual amount (in chronological order) from the cost of the capital facility. When a zero balance is reached, the payback period has been determined. This will often occur in the middle of a year. The portion of the final year is computed by dividing the amount needed to reach zero (the unrecovered portion of the investment) by the entire year's estimated cash inflow. The Review Problem in this chapter illustrates that process.

Advantages and Disadvantages The payback period method is widely used because it is easy to compute and understand. It is especially useful in areas in which technology changes rapidly, such as in Internet companies, and when risk is high, such as when investing in emerging countries. However, the disadvantages of this approach far outweigh its advantages. First, the payback period method does not measure profitability. Second, it ignores differences in the present values of cash flows from different periods; thus, it does not adjust cash flows for the time value of money. Finally, the payback period method emphasizes the time it takes to recover the investment rather than the long-term return on the investment. It ignores all future cash flows after the payback period is reached.

The Accounting Rate-of-Return Method

The **accounting rate-of-return method** is an imprecise but easy way to measure the estimated performance of a capital investment, since it uses financial statement information. This method does not use an investment's cash flows but considers the financial reporting effects of the investment instead. The accounting rate-of-return method measures expected performance using two variables: (1) estimated annual net income from the project and (2) average investment cost.

Accounting Rate-of-Return Calculation The basic equation is as follows:

$$\text{Accounting Rate of Return} = \frac{\text{Average Annual Net Income}}{\text{Average Investment Cost}}$$

Step 1. Compute the average annual net income. Use the cost and revenue data prepared for evaluating the project—that is, revenues minus operating expenses (including depreciation and taxes).

Step 2. Compute the average investment cost in a proposed capital facility as follows:

$$\text{Average Investment Cost} = \left(\frac{\text{Total Investment} - \text{Residual Value}}{2} \right) + \text{Residual Value}$$

Study Note

Payback period is expressed in time, net present value is expressed in money, and accounting rate of return is expressed as a percentage.

Step 3. Compute the accounting rate of return.

To see how the accounting rate-of-return is used in evaluating a proposed capital investment, assume the same facts as before for Neighborhood Communications' interest in purchasing a server. Also assume that the company's management will consider only projects that promise to yield more than a 16 percent return. To determine if the company should invest in the machine, compute the accounting rate of return as follows:

$$\begin{aligned} \text{Accounting Rate of Return} &= \frac{\$17,900 - \$11,696}{\left(\frac{\$51,000 - \$3,000}{2}\right) + \$3,000} \\ &= \frac{\$6,204}{\$27,000} \\ &= 23\%^* \end{aligned}$$

*Rounded.

The projected rate of return is higher than the 16 percent minimum, so management should think seriously about making the investment.

Advantages and Disadvantages The accounting rate-of-return method has been widely used because it is easy to understand and apply, but it does have several disadvantages. First, because net income is averaged over the life of the investment, it is not a reliable figure; actual net income may vary considerably from the estimates. Second, the method is unreliable if estimated annual net incomes differ from year to year. Third, it ignores cash flows. Fourth, it does not consider the time value of money; thus, future and present dollars are treated as equal.

STOP & APPLY >

Sample Communications, Inc., is considering the purchase of new data transmission equipment. Estimated annual net cash inflows from the new equipment are \$575,000. The equipment costs \$2 million and will have no residual value at the end of its five-year life. Compute the payback period for the equipment. Does this method yield a positive or negative response to the proposal to buy the equipment, assuming that the company has set a maximum payback period of four years?

SOLUTION

$$\begin{aligned} \text{Payback Period} &= \text{Cost of Investment} \div \text{Annual Net Cash Inflows} \\ &= \$2,000,000 \div \$575,000 \\ &= 3.5 \text{ Years}^* \end{aligned}$$

*Rounded.

The piece of equipment should be purchased because its payback period is less than the company's maximum payback period of 4 years.

Sample Trucking is considering whether to purchase a delivery truck that will cost \$26,000, last six years, and have an estimated residual value of \$6,000. Average annual net income from the delivery truck is estimated at \$4,000. Sample Trucking's owners want to earn an accounting rate of return of 20 percent. Compute the average investment cost and the accounting rate of return. Should the company make the investment?

(continued)

SOLUTION

$$\begin{aligned} \text{Average Investment Cost} &= \left(\frac{\text{Total Investment} - \text{Residual Value}}{2} \right) + \frac{\text{Residual Value}}{2} \\ &= \left(\frac{\$26,000 - \$6,000}{2} \right) + \$6,000 = \$16,000 \end{aligned}$$

$$\begin{aligned} \text{Accounting Rate-of-Return} &= \frac{\text{Average Annual Net Income}}{\text{Average Investment Cost}} \\ &= \frac{\$4,000}{\$16,000} \\ &= 25\% \end{aligned}$$

The project will exceed the desired return of 20% and should be undertaken.

A LOOK BACK AT**► AIR PRODUCTS AND CHEMICALS INC.**

In this chapter's Decision Point, we asked the following questions:

- Why are capital investment decisions critical for a company like **Air Products and Chemicals Inc.**?
- In evaluating capital investment alternatives, how can managers at Air Products and Chemicals Inc. ensure a wise allocation of resources and minimize the risks involved in capital investments?

Capital investments require making decisions about long-term projects that may have positive or negative consequences for a company for many years. It is therefore essential to take a systematic approach to evaluating such projects. Companies like Air Products and Chemicals have many equipment and factory needs, and installing completely automated systems is costly. Thus, when deciding whether to invest their company's capital in an expensive project like an automated plant, managers must focus on making the best decisions possible by using methods of capital investment analysis, such as the net present value method, the payback period method, or the accounting rate-of-return method. With these methods, they can make wise resource choices and minimize the risks involved in the decision. Air Products and Chemicals' management typically evaluates each proposed investment alternative to determine if it will generate an adequate return for the company before making far-reaching capital investment decisions.

Review Problem**Capital Investment****Analysis****LO2 LO3****LO4 LO5**

Suppose that a company like **Air Products and Chemicals** is considering building a new lights-out facility and has gathered the following information:

Purchase price	\$600,000
Residual value	\$100,000
Desired payback period	3 years
Minimum rate of return	15%

The cash flow estimates are as follows:

Year	Cash Inflows	Cash Outflows	Net Cash Inflows	Projected Net Income
1	\$ 500,000	\$260,000	\$240,000	\$115,000
2	450,000	240,000	210,000	85,000
3	400,000	220,000	180,000	55,000
4	350,000	200,000	150,000	25,000
Totals	<u>\$1,700,000</u>	<u>\$920,000</u>	<u>\$780,000</u>	<u>\$280,000</u>

Required

1. Analyze the company's investment in the new facility using (a) the net present value method, (b) the payback period method, and (c) the accounting rate-of-return method.
2. Summarize your findings from requirement 1, and recommend a course of action.

Answers to Review Problem

1. a. Net present value method (factors are from Table 1 in the appendix on present value tables):

Year	Net Cash Inflows	Present Value Factor	Present Value
1	\$240,000	0.870	\$208,800
2	210,000	0.756	158,760
3	180,000	0.658	118,440
4	150,000	0.572	85,800
4	100,000 (residual value)	0.572	57,200
Total present value			\$629,000
Less cost of original investment			600,000
Net present value			<u>\$ 29,000</u>

- b. Payback period method:

Total cash investment		\$ 600,000
Less cash flow recovery		
Year 1	\$240,000	
Year 2	210,000	
Year 3 (5/6 of \$180,000)	150,000	(600,000)
Unrecovered investment		<u>\$ 0</u>

Payback period: 2.833 (2%) Years, or 2 Years, 10 Months.

- c. Accounting rate-of-return method:

$$\begin{aligned}
 \text{Accounting Rate of Return} &= \frac{\text{Average Annual Net Income}}{\text{Average Investment Cost}} \\
 &= \frac{\$280,000 \div 4}{\left(\frac{\$600,000 - \$100,000}{2}\right) + \$100,000} \\
 &= \frac{\$70,000}{\$350,000} \\
 &= 20\%
 \end{aligned}$$

2. Summary of decision analysis:

	Decision Measures	
	Desired	Calculated
Net present value	—	\$29,000
Accounting rate of return	15%	20%
Payback period	3 Years	2.833 Years

Based on the calculations in requirement 1, the company should invest in the facility.

STOP & REVIEW >

- LO1 Define capital investment analysis, state the purpose of the minimum rate of return, and identify the methods used to arrive at that rate.** Capital investment decisions focus on when and how much to spend on capital facilities and other long-term projects. Capital investment analysis, often referred to as *capital budgeting*, consists of identifying the need for a capital investment, analyzing courses of action to meet that need, preparing reports for management, choosing the best alternative, and dividing funds among competing resource needs. The minimum rate of return, or hurdle rate, is used as a screening mechanism to eliminate from further consideration capital investment requests with anticipated inadequate returns. Managers save time by quickly identifying substandard requests. The most commonly used measure for determining minimum rates of return is cost of capital. Other measures that are used less often are corporate return on investment, industry average return on investment, and bank lending rates.
- LO2 Identify the types of projected costs and revenues used to evaluate alternatives for capital investment.** The accounting rate-of-return method requires measures of net income. Other methods of evaluating capital investments evaluate net cash inflows or cost savings. The analysis process must take into consideration whether each period's cash flows will be equal or unequal. Unless the after-income-tax effects on cash flows are being considered, carrying values and depreciation expense of assets awaiting replacement are irrelevant. Net proceeds from the sale of an old asset and estimated residual value of a new facility represent future cash flows and must be part of the estimated benefit of a project. Depreciation expense on replacement equipment is relevant to evaluations based on after-tax cash flows.
- LO3 Apply the concept of the time value of money.** Cash flows of equal dollar amounts at different times have different values because of the effect of compound interest. This phenomenon is known as the time value of money. Of the evaluation methods discussed in this chapter, only the net present value method takes into account the time value of money.
- LO4 Analyze capital investment proposals using the net present value method.** The net present value method incorporates the time value of money into the analysis of a proposed capital investment. A minimum required rate of return, usually the average cost of capital, is used to discount an investment's expected future cash flows to their present values. The present values are added together, and the amount of the initial investment is subtracted from their total. If the resulting amount, called the net present value, is positive, the rate of return on the investment will exceed the required rate of return, and the investment should be accepted. If the net present value is negative, the return on the investment will be less than the minimum rate of return, and the investment should be rejected.
- LO5 Analyze capital investment proposals using the payback period method and the accounting rate-of-return method.** The payback period method of evaluating a capital investment focuses on the minimum length of time needed to get the amount of the initial investment back in cash. With the accounting rate-of-return method, managers evaluate two or more capital investment proposals and then select the alternative that yields the highest ratio of average annual net income to average cost of investment. Both methods are easy to use, but they are very rough measures that do not consider the time value of money. As a result, the net present value method is preferred.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Accounting rate-of-return method 450 (L05)	Carrying value 440 (L02)	Net present value method 442 (L04)
Capital investment analysis 434 (L01)	Compound interest 442 (L03)	Ordinary annuity 445 (L03)
Capital investment decisions 434 (L01)	Cost of capital 437 (L01)	Payback period method 449 (L05)
	Cost savings 440 (L02)	Present value 449 (L03)
	Future value 443 (L03)	Simple interest 442 (L03)
	Interest 442 (L03)	Time value of money 442 (L03)
	Net cash inflows 440 (L02)	

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Manager's Role in Capital Investment Decisions

SE 1. The supervisor of the Logistics Department has suggested to the plant manager that a new machine costing \$285,000 be purchased to improve material handling operations for the plant's newest product line. How should the plant manager proceed with this request?

L01 Average Cost of Capital

SE 2. Gatwick Industries is considering a \$1 million plant expansion. Management needs to know the average cost of capital to use in evaluating this capital investment decision. The company's capital structure consists of \$3,000,000 of debt at 4 percent interest and \$2,000,000 of stockholders' equity at 6 percent. What is Gatwick Industries' average cost of capital?

L01 Ranking Capital Investment Proposals

SE 3. Zelolo Corp. has the following capital investment requests pending from its three divisions: Request 1, \$60,000, 11 percent projected return; Request 2, \$110,000, 14 percent projected return; Request 3, \$130,000, 16 percent projected return; Request 4, \$160,000, 13 percent projected return; Request 5, \$175,000, 12 percent projected return; and Request 6, \$230,000, 15 percent projected return. Zelolo's minimum rate of return is 13 percent, and \$500,000 is available for capital investment this year. Which requests will be honored, and in what order?

L02 Capital Investment Analysis and Revenue Measures

SE 4. Daize Corp. is analyzing a proposal to switch its factory over to a light-out operation similar to the one discussed in this chapter's Decision Point. To do so, it must acquire a fully automated machine that will be able to produce an entire product line in a single operation. Projected annual net cash inflows from the machine are \$180,000, and projected net income is \$120,000. Why is the projected net income lower than the projected net cash inflows? Identify possible causes for the \$60,000 difference.

L03 Time Value of Money

SE 5. Heidi Layne recently inherited a trust fund from a distant relative. On January 2, the bank managing the trust fund notified Layne that she has the option of receiving a lump-sum check for \$200,000 or leaving the money in the trust fund and receiving an annual year-end check for \$20,000 for each of the next 20 years. Layne likes to earn at least a 5 percent return on her investments. What should she do?

L04 Residual Value and Present Value

SE 6. Annelle Coiner is developing a capital investment analysis for her supervisor. The proposed capital investment has an estimated residual value of \$5,500 at the end of its five-year life. The company uses an 8 percent minimum rate of return. What is the present value of the residual value? Use Table 1 in the appendix on present value tables.

L04 Capital Investment Decision: Net Present Value Method

SE 7. Noway Jose Communications, Inc., is considering the purchase of a new piece of computerized data transmission equipment. Estimated annual net cash inflows for the new equipment are \$590,000. The equipment costs \$2 million, it has a five-year life, and it will have no residual value at the end of the five years. The company has a minimum rate of return of 12 percent. Compute the net present value of the piece of equipment. Should the company purchase it? Use Table 2 in the appendix on present value tables.

L05 Capital Investment Decision: Payback Period Method

SE 8. Using the information about Noway Jose Communications, Inc., in SE 7, compute the payback period for the piece of equipment. Does this method yield a positive or a negative response to the proposal to buy the equipment, assuming that the company sets a maximum payback period of four years?

L05 Capital Investment Decision: Payback Period Method

SE 9. East-West Cable, Inc., is considering the purchase of new data transmission equipment. Estimated annual cash revenues for the new equipment are \$1 million, and operating costs (including depreciation of \$400,000) are \$825,000. The equipment costs \$2 million, it has a five-year life, and it will have no residual value at the end of the five years. Compute the payback period for the piece of equipment. Does this method yield a positive or a negative response to the proposal to buy the equipment if the company has set a maximum payback period of four years?

L05 Capital Investment Decision: Accounting Rate-of-Return Method

SE 10. Best Cleaners is considering whether to purchase a delivery truck that will cost \$50,000, last six years, and have an estimated residual value of \$5,000. Average annual net income from the delivery service is estimated to be \$4,000. Best Cleaners' owners seek to earn an accounting rate of return of 10 percent. Compute the average investment cost and the accounting rate of return. Should the investment be made?

Exercises

L01 Capital Investment Analysis

E 1. Genette Henderson was just promoted to supervisor of building maintenance for the Ford Valley Theater complex. Allpoints Entertainment, Inc., Henderson's employer, uses a company-wide system for evaluating capital investment requests from its 22 supervisors. Henderson has approached you, the corporate controller, for advice on preparing her first proposal. She would also like to become familiar with the entire decision-making process.

1. What advice would you give Henderson before she prepares her first capital investment proposal?
2. Explain the role of capital investment analysis in the management process, including the six key steps taken during planning.

L01 Minimum Rate of Return

E 2. The controller of Olaf Corporation wants to establish a minimum rate of return and would like to use a weighted-average cost of capital. Current data about the corporation's financing structure are as follows: debt financing, 40 percent; preferred stock, 30 percent; common stock, 20 percent; and retained earnings, 10 percent. The cost of debt is 4 percent. The dividend rate on the preferred stock issue is 3 percent. The cost of common stock is 2 percent and the cost of retained earnings is 5 percent.

Compute the weighted-average cost of capital.

LO1 Ranking Capital Investment Proposals

E 3. Managers of the Emerald Bay Furniture Company have gathered all of the capital investment proposals for the year, and they are ready to make their final selections. The following proposals and related rate-of-return amounts were received during the period:

Project	Amount of Investment	Rate of Return (Percentage)
AB	\$ 450,000	19
CD	500,000	28
EF	654,000	12
GH	800,000	32
IJ	320,000	23
KL	240,000	18
MN	180,000	16
OP	400,000	26
QR	560,000	14
ST	1,200,000	22
UV	1,600,000	20

Assume that the company's minimum rate of return is 15 percent and that \$5,000,000 is available for capital investments during the year.

1. List the acceptable capital investment proposals in order of profitability.
2. Which proposals should be selected for this year?

LO2 Income Taxes and Net Cash Flow

E 4. Santa Cruz Company has a tax rate of 20 percent on taxable income. It is considering a capital project that will make the following annual contribution to operating income:

Cash revenues	\$400,000
Cash expenses	(200,000)
Depreciation	(140,000)
Operating income before income taxes	\$ 60,000
Income taxes at 20%	(12,000)
Operating income	<u>\$ 48,000</u>

1. Determine the net cash inflows for this project in two different ways. Are net cash flows the same under either approach?
2. What is the impact of income taxes on net cash flows?

LO3 Using the Present Values Tables

E 5. For each of the following situations, identify the correct factor to use from Tables 1 or 2 in the appendix on present value tables. Also, compute the appropriate present value.

1. Annual net cash inflows of \$5,000 for five years, discounted at 6 percent
2. An amount of \$25,000 to be received at the end of ten years, discounted at 4 percent
3. The amount of \$14,000 to be received at the end of two years, and \$8,000 to be received at the end of years 4, 5, and 6, discounted at 10 percent

L03 Using the Present Values Tables

E 6. For each of the following situations, identify the correct factor to use from Tables 1 or 2 in the appendix on present value tables. Also, compute the appropriate present value.

1. Annual net cash inflows of \$22,500 for a period of twelve years, discounted at 14 percent
2. The following five years of cash inflows, discounted at 10 percent:

Year 1	\$35,000	Year 4	\$40,000
Year 2	20,000	Year 5	50,000
Year 3	30,000		

3. The amount of \$70,000 to be received at the beginning of year 7, discounted at 14 percent

L03 Present Value Computations

E 7. Two machines—Machine M and Machine P—are being considered in a replacement decision. Both machines have about the same purchase price and an estimated ten-year life. The company uses a 12 percent minimum rate of return as its acceptance-rejection standard. Following are the estimated net cash inflows for each machine.

Year	Machine M	Machine P
1	\$12,000	\$17,500
2	12,000	17,500
3	14,000	17,500
4	19,000	17,500
5	20,000	17,500
6	22,000	17,500
7	23,000	17,500
8	24,000	17,500
9	25,000	17,500
10	20,000	17,500
Residual value	14,000	12,000

1. Compute the present value of future cash flows for each machine, using Tables 1 and 2 in the appendix on present value tables.
2. Which machine should the company purchase, assuming that both involve the same capital investment?

L04 Capital Investment Decision: Net Present Value Method

E 8. Qen and Associates wants to buy an automated coffee roaster/grinder/brewer. This piece of equipment would have a useful life of six years, would cost \$218,500, and would increase annual net cash inflows by \$57,000. Assume that there is no residual value at the end of six years. The company's minimum rate of return is 14 percent.

Using the net present value method, prepare an analysis to determine whether the company should purchase the machine. Use Tables 1 and 2 in the appendix on present value tables.

L04 Capital Investment Decision: Net Present Value Method

E 9. H and Y Service Station is planning to invest in automatic car wash equipment valued at \$240,000. The owner estimates that the equipment will increase

annual net cash inflows by \$46,000. The equipment is expected to have a ten-year useful life with an estimated residual value of \$50,000. The company requires a 14 percent minimum rate of return.

Using the net present value method, prepare an analysis to determine whether the company should purchase the equipment. How important is the estimate of residual value to this decision? Use Tables 1 and 2 in the appendix on present value tables.

L04 Capital Investment Decision: Net Present Value Method

E 10. Assume the same facts for H and Y Service Station as in E 9, except assume that the company requires a 20 percent minimum rate of return.

Using the net present value method, prepare an analysis to determine whether the company should purchase the equipment. Use Tables 1 and 2 in the appendix on present value tables.

L05 Capital Investment Decision: Payback Period Method

E 11. Perfection Sound, Inc., a manufacturer of stereo speakers, is thinking about adding a new plastic-injection molding machine. This machine can produce speaker parts that the company now buys from outsiders. The machine has an estimated useful life of 14 years and will cost \$425,000. The residual value of the new machine is \$42,500. Gross cash revenue from the machine will be about \$400,000 per year, and related cash expenses should total \$310,050. Depreciation is estimated to be \$30,350 annually. The payback period should be five years or less.

Use the payback period method to determine whether the company should invest in the new machine. Show your computations to support your answer.

L05 Capital Investment Decision: Payback Period Method

E 12. Soaking Wet, Inc., a manufacturer of gears for lawn sprinklers, is thinking about adding a new fully automated machine. This machine can produce gears that the company now produces on its third shift. The machine has an estimated useful life of ten years and will cost \$800,000. The residual value of the new machine is \$80,000. Gross cash revenue from the machine will be about \$520,000 per year, and related operating expenses, including depreciation, should total \$500,000. Depreciation is estimated to be \$80,000 annually. The payback period should be five years or less.

Use the payback period method to determine whether the company should invest in the new machine. Show your computations to support your answer.

L05 Capital Investment Decision: Accounting Rate-of-Return Method

E 13. Assume the same facts as in E 11 for Perfection Sound, Inc. Management has decided that only capital investments that yield at least a 20 percent return will be accepted.

Using the accounting rate-of-return method, decide whether the company should invest in the machine. Show all computations to support your decision.

L05 Capital Investment Decision: Accounting Rate-of-Return Method

E 14. Assume the same facts as in E 12 for Soaking Wet, Inc. Management has decided that only capital investments that yield at least a 5 percent return will be accepted.

Using the accounting rate-of-return method, decide whether the company should invest in the machine. Show all computations to support your decision.

L05 Capital Investment Decision: Accounting Rate-of-Return Method

E 15. Boink Corporation manufactures metal hard hats for on-site construction workers. Recently, management has tried to raise productivity to meet the growing demand from the real estate industry. The company is now thinking about buying a new stamping machine. Management has decided that only capital investments that yield at least a 14 percent return will be accepted. The new machine would cost \$325,000; revenue would increase by \$98,400 per year; the residual value of the new machine would be \$32,500; and operating cost increases (including depreciation) would be \$75,000.

Using the accounting rate-of-return method, decide whether the company should invest in the machine. Show all computations to support your decision.

Problems**L01 L02 Minimum Rate of Return**

P 1. Capital investment analysis is the main responsibility of Ginny Weiss, the special assistant to the controller of Nazzaro Manufacturing Company. During the previous 12-month period, the company's capital mix and the respective costs were as follows:

	Percentage of Total Financing	Cost of Capital
Debt financing	25%	7%
Preferred stock	15	9
Common stock	50	12
Retained earnings	10	12

Plans for the current year call for a 10 percent shift in total financing from common stock financing to debt financing. Also, the cost of debt financing is expected to increase to 8 percent, although the cost of the other types of financing will remain the same.

Weiss has already analyzed several proposed capital investments. Those projects and their projected rates of return are as follows: Project M, 9.5 percent; Equipment Item N, 8.5 percent; Product Line O, 15.0 percent; Project P, 6.9 percent; Product Line Q, 10.5 percent; Equipment Item R, 11.9 percent; and Project S, 11.0 percent.

Required

- Using the expected adjustments to cost and capital mix, compute the weighted-average cost of capital for the current year.
- Identify the proposed capital investments that should be implemented based on the cost of capital calculated in requirement 1.

L03 L04 Net Present Value Method

P 2. Sonja and Sons, Inc., owns and operates a group of apartment buildings. Management wants to sell one of its older four-family buildings and buy a new building. The old building, which was purchased 25 years ago for \$100,000, has a 40-year estimated life. The current market value is \$80,000, and if it is sold, the cash inflow will be \$67,675. Annual net cash inflows from the old building are expected to average \$16,000 for the remainder of its estimated useful life.

The new building will cost \$300,000. It has an estimated useful life of 25 years. Net cash inflows are expected to be \$50,000 annually.

Assume that (1) all cash flows occur at year end, (2) the company uses straight-line depreciation, (3) the buildings will have a residual value equal to 10 percent of their purchase price, and (4) the minimum rate of return is 14 percent. Use Tables 1 and 2 in the appendix on present value tables.

Required

1. Compute the present value of future cash flows from the old building.
 2. What will the net present value of cash flows be if the company purchases the new building?
 3. Should the company keep the old building or purchase the new one?
- Manager insight** ▶

L03 L04 Net Present Value Method

P 3. The management of Better Plastics has recently been looking at a proposal to purchase a new plastic-injection-style molding machine. With the new machine, the company would not have to buy small plastic parts to use in production. The estimated useful life of the machine is 15 years, and the purchase price, including all setup charges, is \$400,000. The residual value is estimated to be \$40,000. The net addition to the company's cash inflow as a result of the savings from making the parts is estimated to be \$70,000 a year. Better Plastics' management has decided on a minimum rate of return of 14 percent. Use Tables 1 and 2 in the appendix on present value tables.

Required

1. Using the net present value method to evaluate this capital investment, determine whether the company should purchase the machine. Support your answer.
 2. If the management of Better Plastics had decided on a minimum rate of return of 16 percent, should the machine be purchased? Show all computations to support your answer.
- Manager insight** ▶

L05 Accounting Rate-of-Return and Payback Period Methods

P 4. The Raab Company is expanding its production facilities to include a new product line, a sporty automotive tire rim. Tire rims can now be produced with little labor cost using new computerized machinery. The controller has advised management about two such machines. The details about each machine are as follows:

	XJS Machine	HZT Machine
Cost of machine	\$500,000	\$550,000
Residual value	50,000	55,000
Net income	34,965	40,670
Annual net cash inflows	91,215	90,170

The company's minimum rate of return is 12 percent. The maximum payback period is six years. (Where necessary, round calculations.)

Required

1. For each machine, compute the projected accounting rate of return.
 2. Compute the payback period for each machine.
 3. Based on the information from requirements 1 and 2, which machine should be purchased? Why?
- Manager insight** ▶

L03 L04 Capital Investment Decision: Comprehensive

L05 P 5. The Arcadia Manufacturing Company, based in Arcadia, Florida, is one of the fastest-growing companies in its industry. According to Ms. Prinze, the

company's production vice president, keeping up-to-date with technological changes is what makes the company successful.

Prinze believes a new machine will fill an important need. The machine has an estimated useful life of four years, a purchase price of \$250,000, and a residual value of \$25,000. The company controller has estimated average annual net income of \$11,250 and the following cash flows for the new machine:

Year	Cash Flow Estimates		
	Cash Inflows	Cash Outflows	Net Cash Inflows
1	\$325,000	\$250,000	\$75,000
2	320,000	250,000	70,000
3	315,000	250,000	65,000
4	310,000	250,000	60,000

Prinze uses a 12 percent minimum rate of return and a three-year payback period for capital investment evaluation purposes.

Required

- Analyze the data about the machine, and decide if the company should purchase it. Use the following evaluation approaches in your analysis: (a) the net present value method, (b) the accounting rate-of-return method, and (c) the payback period method. Use Tables 1 and 2 in the appendix on present value tables.
- Summarize the information generated in requirement 1, and make a recommendation to Prinze.

Alternate Problems

L01 L02 Minimum Rate of Return

P 6. Capital investment analysis is the main responsibility of the controller of Glory Company. During the previous 12-month period, the company's capital mix and the respective costs were as follows:

	Percentage of Total Financing	Cost of Capital
Debt financing	40%	2%
Preferred stock	10	3
Common stock	30	8
Retained earnings	20	6

Plans for the current year call for a 10 percent shift in total financing from debt financing to common stock financing. Also, the cost of debt financing is expected to increase to 4 percent, although the cost of the other types of financing will remain the same.

The controller has already analyzed several proposed capital investments. Those projects and their projected rates of return are as follows: Project M, 7.5 percent; Equipment Item N, 6.2 percent; Product Line O, 5.0 percent; Product Line P, 6.9 percent; Product Line Q, 1.5 percent; Equipment Item R, 3.9 percent; and Project S, 6.0 percent.

Required

- Using the expected adjustments to cost and capital mix, compute the weighted-average cost of capital for the current year.
- Identify the proposed capital investments that should be implemented based on the cost of capital calculated in requirement 1.

L03 L04 Comparison of Alternatives: Net Present Value Method

P7. City Sights, Ltd., operates a tour and sightseeing business. Its trademark is the use of trolley buses. Each vehicle has its own identity and is specially made for the company. Gridlock, the oldest bus, was purchased 15 years ago and has 5 years of its estimated useful life remaining. The company paid \$25,000 for Gridlock, and the bus could be sold today for \$20,000. Gridlock is expected to generate average annual net cash inflows of \$24,000 for the remainder of its estimated useful life.

Management wants to replace Gridlock with a modern-looking vehicle called Phantom. Phantom has a purchase price of \$140,000 and an estimated useful life of 20 years. Net cash inflows for Phantom are projected to be \$40,000 per year.

Assume that (1) all cash flows occur at year end, (2) each vehicle's residual value equals 10 percent of its purchase price, and (3) the minimum rate of return is 10 percent. Use Tables 1 and 2 in the appendix on present value tables.

Required

- Compute the present value of the future cash flows from Gridlock.
- Compute the net present value of cash flows if Phantom were purchased.
- Should City Sights keep Gridlock or purchase Phantom?

Manager insight ►

L03 L04 Net Present Value Method

P8. Mansion is a famous restaurant in the French Quarter of New Orleans. Bouillabaisse Sophie is Mansion's house specialty. Management is considering the purchase of a machine that would prepare all the ingredients, mix them automatically, and cook the dish to the restaurant's specifications. The machine will function for an estimated 12 years, and the purchase price, including installation, is \$250,000. Estimated residual value is \$25,000. This labor-saving device is expected to increase cash flows by an average of \$42,000 per year during its estimated useful life. For capital investment decisions, the restaurant uses a 12 percent minimum rate of return. Use Tables 1 and 2 in the appendix on present value tables.

Required

- Using the net present value method, determine if the company should purchase the machine. Support your answer.
- If management had decided on a minimum rate of return of 14 percent, should the machine be purchased? Show all computations to support your answer.

Manager insight ►

L05 Accounting Rate-of-Return and Payback Period Methods

P9. The Cute Car Company is expanding its production facilities to include a new product line, an energy-efficient sporty convertible. The car can be produced with little labor cost using computerized machinery. There are two such machines to choose from. The details about each machine are as follows:

	GoGo Machine	Autom Machine
Cost of machine	\$300,000	\$325,000
Residual value	30,000	32,500
Net income	25,000	30,000
Annual net cash inflows	60,000	50,000

The company's minimum rate of return is 15 percent. The maximum payback period is six years. (Where necessary, round calculations.)

Required

- Manager insight ►
1. For each machine, compute the projected accounting rate of return.
 2. Compute the payback period for each machine.
 3. Based on the information from requirements 1 and 2, which machine should be purchased? Why?

L03 L04 Capital Investment Decision: Comprehensive

L05 P 10. Pressed Corporation wants to buy a new stamping machine. The machine will provide the company with a new product line: pressed rubber food trays for kitchens. Two machines are being considered; the data for each machine are as follows:

	ETZ Machine	LKR Machine
Cost of machine	\$350,000	\$370,000
Net income	\$39,204	\$48,642
Annual net cash inflows	\$64,404	\$75,642
Residual value	\$28,000	\$40,000
Estimated useful life in years	10	10

The company's minimum rate of return is 16 percent, and the maximum allowable payback period is 5.0 years.

Required

- Manager insight ►
1. Compute the net present value for each machine.
 2. Compute the accounting rate of return for each machine.
 3. Compute the payback period for each machine.
 4. From the information generated in requirements 1, 2, and 3, decide which machine should be purchased. Why?

ENHANCING Your Knowledge, Skills, and Critical Thinking

L01 Evaluation of Proposed Capital Investments

C 1. The board of directors of the Tanashi Corporation met to review a number of proposed capital investments that would improve the quality of company products. One production-line manager requested the purchase of new computer-integrated machines to replace the older machines in one of the ten production departments at the Tokyo plant. Although the manager had presented quantitative information to support the purchase of the new machines, the board members asked the following important questions:

1. Why do we want to replace the old machines? Have they deteriorated? Are they obsolete?
2. Will the new machines require less cycle time?
3. Can we reduce inventory levels or save floor space by replacing the old machines?
4. How expensive is the software used with the new machines?

5. Will we be able to find highly skilled employees to maintain the new machines? Or can we find workers who are trainable? What would it cost to train workers? Would the training disrupt the staff by causing relocations?
6. Would the implementation of the machines be delayed because of the time required to recruit and train new workers?
7. How would the new machines affect the other parts of the manufacturing systems? Would the company lose some of the flexibility in its manufacturing systems if it introduced the new machines?

The board members believe that the qualitative information needed to answer their questions could lead to the rejection of the project, even though it would have been accepted based on the quantitative information.

1. Identify the questions that can be answered with quantitative information. Give an example of the quantitative information that could be used.
2. Identify the questions that can be answered with qualitative information. Explain why this information could negatively influence the capital investment decision even though the quantitative information suggests a positive outcome.

L03 L04 Using Net Present Value

C 2. The McCall Syndicate owns four resort hotels in Europe. Because the Paris operation (Hotel 1) has been booming over the past five years, management has decided to build an addition to the hotel. This addition will increase the hotel's capacity by 20 percent. A construction company has bid to build the addition at a cost of \$30,000,000. The building will have an increased residual value of \$3,000,000.

Daj Van Dyke, the controller, has started an analysis of the net present value for the project. She has calculated the annual net cash inflows by subtracting the increase in cash operating expenses from the increase in cash inflows from room rentals. Her partially completed schedule follows:

Year	Net Cash Inflows
1–20 (each year)	\$3,900,000

Capital investment projects must generate a 12 percent minimum rate of return to qualify for consideration.

Using net present value analysis, evaluate the proposal and make a recommendation to management. Explain how your recommendation would change if management were willing to accept a 10 percent minimum rate of return. Use Tables 1 and 2 in the appendix on present value tables.

L04 Capital Investment Analysis

C 3. Automated teller machines (ATMs) have become common in the banking industry. San Angelo Federal Bank is planning to replace some old teller machines and has decided to use the York Machine. Nola Chavez, the controller, has prepared the analysis shown at the top of the next page. She has recommended the purchase of the machine based on the positive net present value shown in the analysis.

The York Machine has an estimated useful life of five years and an expected residual value of \$35,000. Its purchase price is \$385,000. Two existing ATMs, each having a carrying value of \$25,000, can be sold to a neighboring bank for a total of \$50,000. Annual operating cash inflows are expected to increase in the following manner:

Year 1	\$79,900
Year 2	76,600
Year 3	79,900
Year 4	83,200
Year 5	86,500

**San Angelo Federal Bank
Capital Investment Analysis
Net Present Value Method**

Year	Net Cash Inflows	Present Value Factor	Present Value
1	\$ 85,000	0.909	\$ 77,265
2	80,000	0.826	66,080
3	85,000	0.751	63,835
4	90,000	0.683	61,470
5	95,000	0.621	58,995
5 (residual value)	35,000	0.621	<u>21,735</u>
Total present value			\$349,380
Initial investment		\$385,000	
Less proceeds from the sale of existing teller machines		<u>50,000</u>	
Net capital investment			(335,000)
Net present value			<u>\$ 14,380</u>

The San Angelo Federal Bank uses straight-line depreciation. The minimum rate of return is 12 percent.

1. Analyze Chavez's work. What changes need to be made in her capital investment analysis?
2. What would be your recommendation to bank management about the purchase of the York Machine?

LO4 Net Present Value of Cash Flows

C 4. CPC Corporation is an international plumbing equipment and supply company located in southern California. The manager of the Pipe Division is considering the purchase of a computerized copper pipe machine that costs \$120,000.

The machine has a six-year life, and its expected residual value after six years of use will be 10 percent of its original cost. Cash revenue generated by the new machine is projected to be \$50,000 in year 1 and will increase by \$10,000 each year for the next five years. Variable cash operating costs will be materials and parts, 25 percent of revenue; machine labor, 5 percent of revenue; and overhead, 15 percent of revenue. First-year sales and marketing cash outflows are expected to be \$10,500 and will decrease by 10 percent each year over the life of the new machine. Anticipated cash administrative expenses will be \$2,500 per year. The company uses a 15 percent minimum rate of return for all capital investment analyses.

1. Prepare an Excel spreadsheet to compute the net present value of the anticipated cash flows for the life of the proposed new machine. Use the following format:

Projected Cash Outflows									
Future Time Period	Projected Cash Revenue	Materials and Parts	Machine Labor	Overhead	Sales and Marketing	Administrative Expenses	Projected Net Cash Inflows	15% Factor	Present Value

Should the company invest in the new machine?

2. After careful analysis, the controller has determined that the variable rate for materials and parts can be reduced to 22 percent of revenue. Will this reduction in cash outflow change the decision about investing in the new machine? Explain your answer.
3. The marketing manager has determined that the initial estimate of sales and marketing cash expenses was too high and has reduced that estimate by \$1,000. The 10 percent annual reductions are still expected to occur. Together with the change in 2, will this reduction affect the initial investment decision? Explain your answer.

L04 Ethics, Capital Investment Decisions, and the New Globally Competitive Business Environment

C 5. Marika Jonssen is the controller of Bramer Corporation, a globally competitive producer of standard and custom-designed window units for the housing industry. As part of the corporation's move to become automated, Jonssen was asked to prepare a capital investment analysis for a robot-guided aluminum extruding and stamping machine. This machine would automate the entire window-casing manufacturing line. She has just returned from an international seminar on the subject of qualitative inputs into the capital investment decision process and is eager to incorporate those new ideas into the analysis. In addition to the normal net present value analysis (which produced a significant negative result), Jonssen factored in figures for customer satisfaction, scrap reduction, reduced inventory needs, and reputation for quality. With the additional information included, the analysis produced a positive response to the decision question.

When the chief financial officer finished reviewing Jonssen's work, he threw the papers on the floor and said, "What kind of garbage is this! You know it's impossible to quantify such things as customer satisfaction and reputation for quality. How do you expect me to go to the board of directors and explain your work? I want you to redo the entire analysis and follow only the traditional approach to net present value. Get it back to me in two hours!"

What is Jonssen's dilemma? What ethical courses of action are available to her?

L02 L03 Cookie Company (Continuing Case)

L04 L05 C 6. Suppose your cookie company is now a corporation that has granted franchises to more than 50 stores. Currently, only 10 of the 50 stores have computerized machines for mixing cookie dough. Because of a tremendous increase in demand for cookie dough, you, as the corporation's president, are considering purchasing 10 more computerized mixing machines by the end of this month. You are writing a memo evaluating this purchase that you will present at the board of directors' meeting next week.

According to your research, the 10 new machines will cost \$320,000. They will function for an estimated five years and should have a \$32,000 residual value. All of your corporation's capital investments are expected to produce a 20 percent minimum rate of return, and they should be recovered in three years or less. All fixed assets are depreciated using the straight-line method. The forecasted increase in operating results for the aggregate of the 10 new machines is as follows:

Year	Cash Flow Estimates	
	Cash Inflows	Cash Outflows
1	\$310,000	\$210,000
2	325,000	220,000
3	340,000	230,000
4	300,000	210,000
5	260,000	180,000

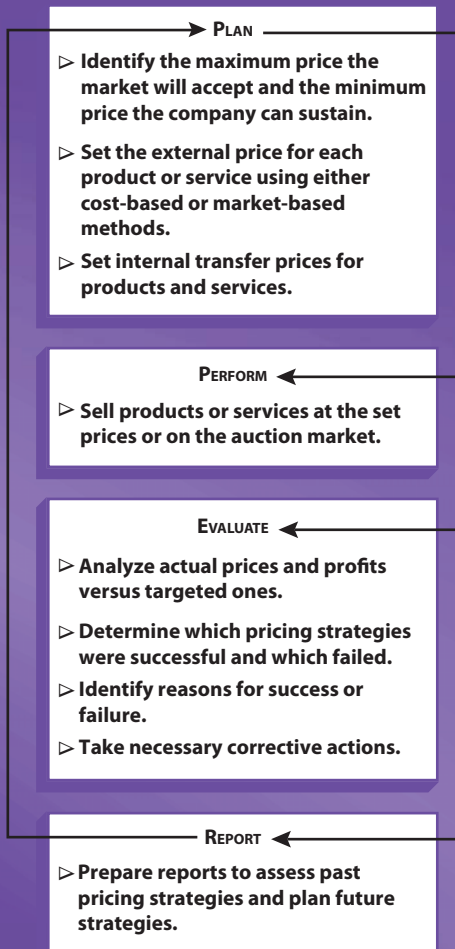
1. In preparation for writing your memo, answer the following questions:
 - a. What kinds of information do you need to prepare this memo?
 - b. Why is the information relevant?
 - c. Where would you find the information?
 - d. When would you want to obtain the information?
2. Analyze the purchase of the machines, and decide if your corporation should purchase them. Use (a) the net present value method, (b) the accounting rate-of-return method, and (c) the payback period method.

CHAPTER

12

Pricing Decisions, Including Target Costing and Transfer Pricing

The Management Process



The price managers set for products and services impacts business operations both internally and externally.

In this chapter, we examine the various approaches that managers use to establish the prices of goods and services. There are many such approaches; however, each approach may very well produce a different price for the same product or service. The process of establishing a correct price is, in fact, more of an art than a science. It depends on a manager's ability to analyze the marketplace and anticipate customers' reactions to a product or service and its price.

LEARNING OBJECTIVES

- L01** Identify the objectives and rules used to establish prices of goods and services, and relate pricing issues to the management process. (pp. 472–475)
- L02** Describe economic pricing concepts, including the auction-based pricing method used on the Internet. (pp. 475–478)
- L03** Use cost-based pricing methods to develop prices. (pp. 478–484)
- L04** Describe target costing, and use that concept to analyze pricing decisions and evaluate a new product opportunity. (pp. 485–488)
- L05** Describe how transfer pricing is used for transferring goods and services and evaluating performance within a division or segment. (pp. 489–493)

DECISION POINT ► A MANAGER'S FOCUS LAB 126

Lab 126, a subsidiary of **Amazon.com**, dominates the e-book market. Its latest product is the Kindle DX, a larger version of the original Kindle. These portable readers allow users to wirelessly download e-books and other digital media to a high-resolution electronic display; no computer is required. Kindle users can buy e-books online from Amazon.com for a small fee. Another of Lab 126's products, the Kindle for iPhone application, provides an easy-to-use interface that enables users of **Apple's** iPhones and iPods to read Kindle books. Competition among Lab 126's products, the Sony Reader, and other e-book readers is very keen, and there is constant pressure to offer more technology-rich features to outdo competitors.

- Why do managers generally use several pricing approaches?
- Why might Lab 126's managers use target costing to establish a price for the Kindle?



The Pricing Decision and the Manager

LO1 Identify the objectives and rules used to establish prices of goods and services, and relate pricing issues to the management process.

As we have noted, establishing a correct price depends on a manager's ability to analyze the marketplace and anticipate customers' reactions to a product or service and its price.

Pricing Policies

Setting appropriate prices is one of the most difficult decisions that managers must make on a day-to-day basis. Because such decisions affect the long-term survival of any profit-oriented enterprise, a company's long-term objectives should include a pricing policy. A pricing policy is one way in which companies differentiate themselves from their competitors. Compare, for example, the pricing policies of luxury brands like **Lexus** and **Nordstrom** with those of cost-driven companies like **Toyota** or **Wal-Mart**. Consider also how prices are set on **eBay** and **Priceline.com**. Although all these companies are successful, their pricing policies differ significantly because each company has different pricing objectives.

In addition, companies may use pricing policies to differentiate among their own brands. For example, **Gap, Inc.**, uses price to differentiate the Gap brand from the brand of its subsidiary, **Old Navy**, and **Mercedes Benz** uses price to differentiate the Smart Car from the Mercedes. Thus, for each product brand, the company has identified the market segment that it intends to serve and has developed pricing objectives to meet the needs of that market.

Pricing Policy Objectives

Possible objectives of a pricing policy include the following:

1. *Identifying and adhering to both short-run and long-run pricing strategies.* Pricing strategies depend on many factors and conditions. The pricing strategies of companies that produce standard items or commodities for a competitive marketplace will differ from the pricing strategies of companies that make custom-designed items. In a competitive market, companies can reduce prices to draw sales away from competing companies. They can also continuously add value-enhancing features and upgrades to their products and services to create the impression that customers are receiving more for their money. In contrast, a company that makes custom-designed items can be more conservative in its pricing strategy.
2. *Maximizing profits.* Maximizing profits has traditionally been the underlying objective of any pricing policy.
3. *Maintaining or gaining market share.* One key indicator of profit potential is an increasing share of the market. Maintaining or gaining market share is closely related to pricing strategies. However, market share is important only if sales are profitable. To increase market share by reducing prices below cost can be economically disastrous unless such a move is accompanied by strategies that compensate for the lost revenues.
4. *Setting socially responsible prices.* Maximizing profits remains a dominant factor in price setting. However, to enhance their standing with the public and thus ensure their long-term survival, companies today also consider whether their prices are socially responsible. The pricing policies of many companies now take into consideration a variety of social concerns, including environmental factors, the influence of an aging population, legal constraints, and ethical issues.

5. *Maintaining a minimum rate of return on investment.* Organizations view each product or service as an investment. They will not invest in making a product or providing a service unless it will provide a minimum return. To maintain a minimum return on investment, an organization, when setting prices, adds a markup percentage to each product's costs of production. This markup percentage is closely related to the objective of profit maximization.
6. *Being customer focused.* Taking customers' needs into consideration when setting prices or increasing a product's value to customers is important for at least three reasons. These reasons are as follows:
 - ▶ Sensitivity to customers is necessary to sustain sales growth.
 - ▶ Customers' acceptance is crucial to success in a competitive market.
 - ▶ Prices should reflect the enhanced value that the company adds to the product or service, which is another way of saying that prices are customer-driven.

Pricing and the Management Process

For an organization to stay in business, its selling price must (1) be competitive with the competition's price, (2) be acceptable to customers, (3) recover all costs incurred in bringing the product or service to market, and (4) return a profit. If a manager deviates from any of these four pricing rules, there must be a specific short-run objective that accounts for the change. Breaking those pricing rules for a long period will force a company into bankruptcy. The sidebar on the first page of this chapter illustrates the elements of pricing that managers need to consider at each step in the management process.

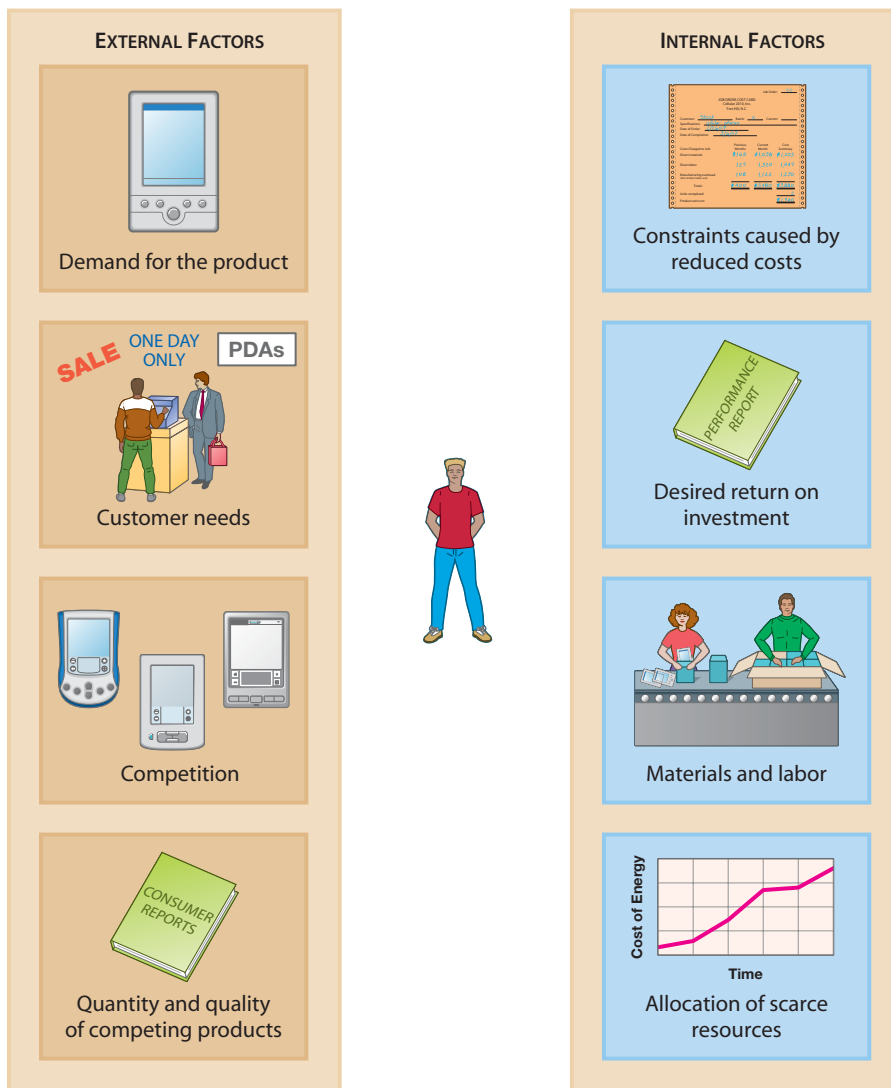
External and Internal Pricing Factors

When making and evaluating pricing decisions, managers must consider many factors. As shown in Figure 12-1, some of those factors relate to the external market, and others relate to internal constraints.

- ▶ The external factors include demand for the product, customer needs, competition, and quantity and quality of competing products or services.
- ▶ The internal factors include constraints caused by costs, desired return on investment, quality and quantity of materials and labor, and allocation of scarce resources.

FIGURE 12-1
External and Internal Factors
Affecting Pricing Decisions

WHEN MAKING AND EVALUATING PRICING DECISIONS



STOP & APPLY >

Towne's Tire Outlet features more than a dozen brands of tires. Two of the brands are Gripper and Roadster. Information about the two brands is as follows:

	Gripper	Roadster
Selling price:		
Single tire, installed	\$125	\$110
Set of four tires, installed	460	400
Cost per tire	90	60

As shown, selling prices include installation costs, which are \$20 per tire.

1. Compute each brand's net unit selling price after installation for both a single tire and a set of four.
2. Was cost the main consideration in setting those prices?
3. What other factors could have influenced those prices?

(continued)

SOLUTION

1.

	Gripper		Roadster	
	One Tire	Four Tires	One Tire	Four Tires
Selling price	\$125	\$460	\$110	\$400
Less installation cost	20	80	20	80
Net selling price	<u>\$105</u>	<u>\$380</u>	<u>\$ 90</u>	<u>\$320</u>
Unit selling price	<u>\$105</u>	<u>\$ 95</u>	<u>\$ 90</u>	<u>\$ 80</u>

2. The Gripper tire costs the company \$30 more than the Roadster tire, but there is only a \$15 difference between the two selling prices. The low cost of the Roadster allows the company to sell it at a significantly lower price than the higher-cost Gripper. Therefore, customers perceive the Roadster to be a better purchase value than the Gripper. The company is not using cost as a major consideration in its pricing decisions.
3. Other pricing considerations include local competition, quality versus price, and demand for the tires.

Economic Pricing Concepts

LO2 Describe economic pricing concepts, including the auction-based pricing method used on the Internet.

The economic approach to pricing is based on microeconomic theory. Pricing plays a strong role in the concepts underlying microeconomic theory as it is practiced at individual firms. Every firm is in business to maximize profits. Although each product has its own set of revenues and costs, microeconomic theory states that profit will be greatest when the difference between total revenue and total cost is greatest.

Total Revenue and Total Cost Curves

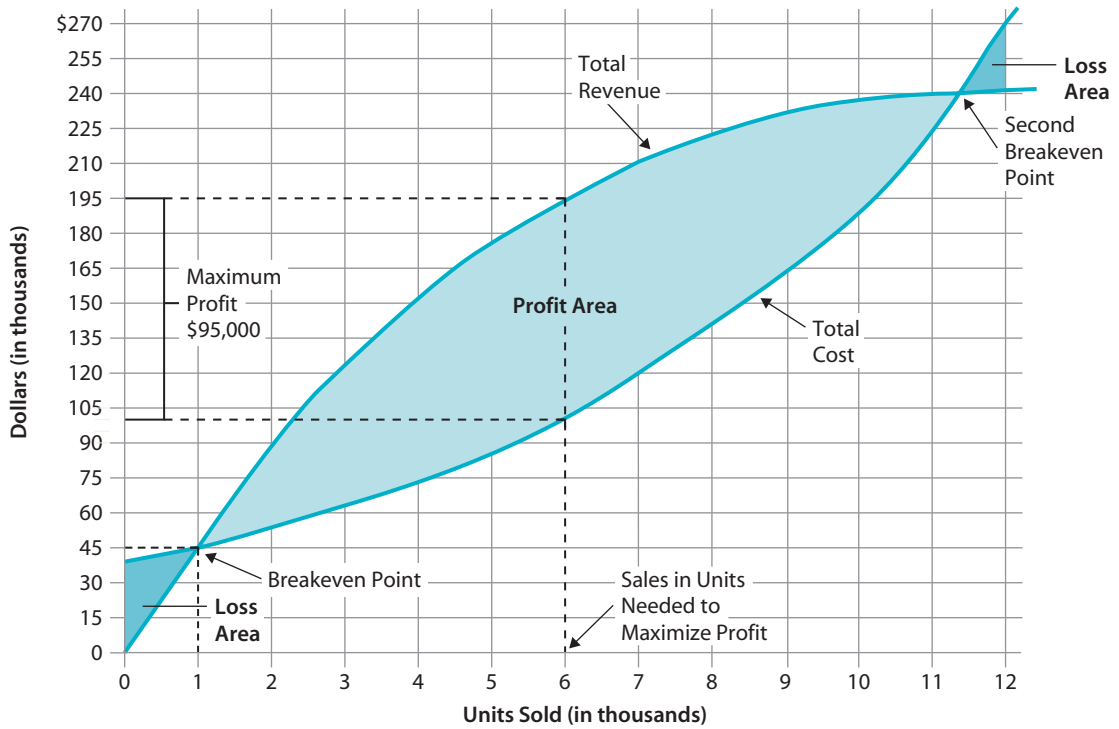
It may seem that if a company could produce an infinite number of products, it would realize the maximum profit. But this is not the case, and microeconomic theory explains why. Figure 12-2A shows the economist's view of a breakeven chart. It contains two breakeven points, between which is a large space labeled "profit area."

Total Revenues Notice that the total revenue line is curved rather than straight. The theory behind this is that as a product is marketed, because of competition and other factors, price reductions will be necessary if the firm is to sell additional units. Total revenue will continue to increase, but the rate of increase will diminish as more units are sold. Therefore, the slope of the total revenue line declines, and the line curves toward the right.

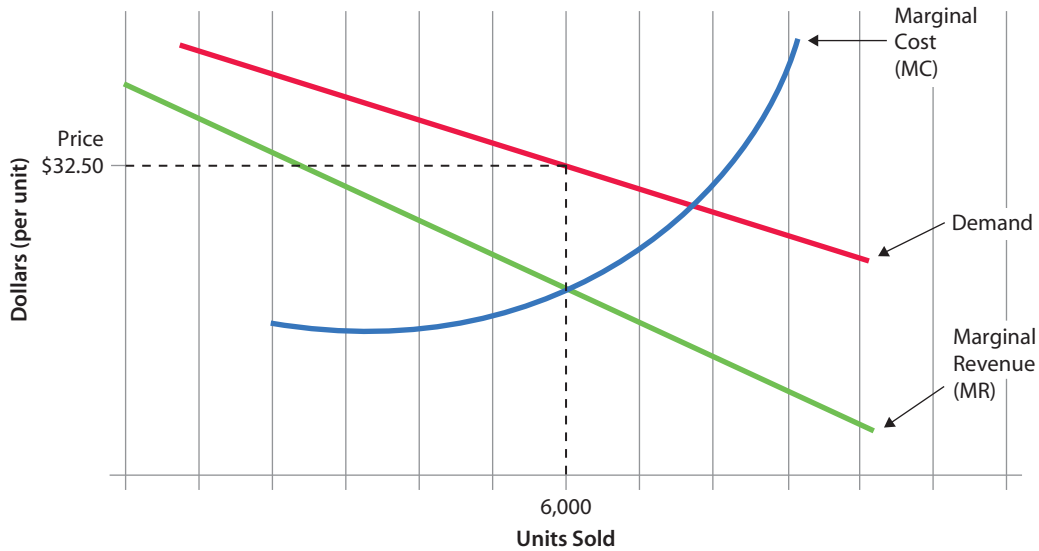
Total Costs Costs react in an opposite way. Over the assumed relevant range, variable and fixed costs are fairly predictable, with fixed costs remaining constant and variable costs being the same per unit. The result is a straight line for total costs. However, following microeconomic theory, costs per unit will increase as more units are sold because fixed costs will change. As costs move into different relevant ranges, such fixed costs as supervision and depreciation increase, and competition causes marketing costs to rise. As the company pushes for more and more products from limited facilities, repair and maintenance costs also increase. And as the push from management increases, total costs per unit rise at an accelerating rate. The result is that the slope of the total cost line in Figure 12-2A increases, and the line begins curving upward. The total revenue line and the total cost line then cross again; beyond that point, the company suffers a loss on additional sales.

FIGURE 12-2
Microeconomic Pricing
Theory

A. TOTAL REVENUE AND TOTAL COST CURVES



B. MARGINAL REVENUE AND MARGINAL COST CURVES



Profit Maximization Profits are maximized at the point where the difference between total revenue and total cost is the greatest. In Figure 12-2A, this point is 6,000 units of sales. At that sales level, total revenue will be \$195,000; total cost, \$100,000; and profit, \$95,000. In theory, if one additional unit is sold, profit per unit will drop because total cost is rising at a faster rate than total revenues. As you can see, if the company sells 11,000 units, total profits will be almost entirely depleted by the rising costs. Therefore, 6,000 sales units is the optimal operating level, and the price charged at that level is the optimal price.

Marginal Revenue and Marginal Cost Curves

Economists use marginal revenue and marginal cost to help determine the optimal price for a product or service. **Marginal revenue** is the change in total revenue caused by a one-unit change in output. **Marginal cost** is the change in total cost caused by a one-unit change in output. Graphic curves for marginal revenue and marginal cost are created by measuring and plotting the rate of change in total revenue and total cost at various activity levels.

If you computed marginal revenue and marginal cost for each unit sold in our example and plotted them on a graph, the lines would resemble those in Figure 12-2B. Notice that the marginal cost line crosses the marginal revenue line at 6,000 units. After that point, profit per unit will decrease as additional units are sold. Marginal cost will exceed marginal revenue for each unit sold over 6,000. Profit will be maximized when the marginal revenue and marginal cost lines intersect. By projecting this point onto the product's demand curve, you can locate the optimal price, which is \$32.50 per unit.

If all the information used in microeconomic theory were certain, picking the optimal price would be fairly easy. But most information used in such an analysis relies on projected amounts for unit sales, product costs, and revenues. Nevertheless, developing such an analysis usually highlights cost patterns and the unanticipated influences of demand. For this reason, it is important that managers consider the microeconomic approach to pricing when setting product prices. However, the results of this type of analysis should not be the only data relied on.

Auction-Based Pricing

In recent years, as a result of auctions hosted by Internet companies like **eBay**, **Yahoo**, and **Price-line.com**, auction-based pricing has skyrocketed in popularity. **Auction-based pricing** occurs in two ways: Either sellers post what they have to sell, ask for price bids, and accept a buyer's offer to purchase at a certain price, or buyers interested in buying something post what they want, ask for prices, and accept a seller's offer to sell at a certain price.

To illustrate the seller's auction-based price, suppose a corporation like **Intel** has an excess of silicon chips after a production run. The company posts a message on the Internet asking for the quantity of silicon chips that prospective buyers are willing to buy and the price that they are willing to pay. After the offers are received, the company prepares a demand curve of all offers and selects the one that best fits the quantity of silicon chips it has available for sale.

To illustrate the buyer's auction-based price, consider an individual who wants to fly round-trip to Europe on certain dates and posts his or her needs on one of the Internet's auction markets. After receiving the offers to sell round-trip tickets to Europe, the individual will accept the offer that best suits his or her needs.



FOCUS ON BUSINESS PRACTICE

What's It Worth to Shop Online?

The Internet makes it possible to price efficiently at the level of marginal costs. For instance, at websites like **Priceline.com**, travelers pick a destination and a price they are willing to pay for air or hotel reservations. The price must be guaranteed by credit card. An airline or hotel has a limited

amount of time to accept or reject the bid. If the bid is accepted, the buyer is obligated to pay for the air or hotel reservation. The hotels and airlines are often willing to accept the low bid prices because the marginal cost of filling an additional seat on an airplane or an extra room in a hotel is very low.



FOCUS ON BUSINESS PRACTICE

How Big a Problem Is Fraud on the Internet?

The Internet Fraud Complaint Center, which is co-sponsored by the Federal Bureau of Investigation, recently reported that 44.9 percent of the complaints it received were about Internet auction fraud, 19.0 percent were about

nondelivery of merchandise/payment, and 4.9 percent were about check fraud. Other categories of complaints included credit/debit card fraud, confidence schemes, and financial institution fraud.

Auction-based pricing will continue to grow in importance as a result of the escalating amount of business that is being conducted over the Internet by both organizations and individuals. Just about anything can be bought or sold via the Internet.

STOP & APPLY >

Assume that a product has the total cost and total revenue curves pictured in Figure 26-2A. Also assume that the difference between total revenue and total cost is the same at the 4,000- and 9,000-unit levels. If you had to choose between those two levels of activity as goals for total sales over the life of the product, which would you prefer? Why?

SOLUTION

The 4,000-unit level is preferable. Given the same total profit will be made at both the 4,000- and the 9,000-unit levels, it does not make economic sense to produce the additional 5,000 units.

Cost-Based Pricing Methods

LO3 Use cost-based pricing methods to develop prices.

Managers may use a variety of pricing methods. A good starting point for developing a price is to base it on the cost of producing a good or service. Two pricing methods based on cost are gross margin pricing and return on assets pricing. Remember that in a competitive environment, market prices and conditions also influence price; however, if prices do not cover a company's costs, the company will eventually fail.

To illustrate the two methods of cost-based pricing, we will use Bookit Company as an example. Bookit buys parts from outside vendors and assembles them into very basic e-book readers. In the previous accounting period, the company produced 14,750 readers. The total costs and unit costs incurred follow.

	<i>Total Costs</i>	<i>Unit Costs</i>
Variable production costs		
Direct materials and parts	\$ 88,500	\$ 6.00
Direct labor	66,375	4.50
Variable overhead	44,250	3.00
Total variable production costs	<u>\$199,125</u>	<u>\$13.50</u>
Fixed overhead	154,875	10.50
Total production costs	<u>\$354,000</u>	<u>\$24.00</u>
Selling, general, and administrative expenses		
Selling expenses	\$ 73,750	\$ 5.00
General expenses	36,875	2.50
Administrative expenses	22,125	1.50
Total selling, general, and administrative expenses	<u>\$132,750</u>	<u>\$ 9.00</u>
Total costs and expenses	<u>\$486,750</u>	<u>\$33.00</u>

No changes in unit costs are expected this period. The desired profit for the period is \$110,625. The company uses assets totaling \$921,875 in producing the e-book readers and expects a 14 percent return on those assets.

Gross Margin Pricing

Study Note

The gross margin pricing method is also called the *income statement method*.

Gross margin pricing emphasizes the use of income statement information to determine a selling price. (Gross margin is the difference between sales and the total production costs of those sales.) In gross margin pricing, the price is computed using a markup percentage based on a product's total production costs. The markup percentage is designed to include all costs other than those used in the computation of gross margin. Therefore, the gross margin markup percentage covers selling, general, and administrative expenses and the desired profit. Because an accounting system often provides management with unit production cost data, both variable and fixed, this method of determining selling price can be easily applied.

Gross Margin Calculations With gross margin pricing, there are three ways of determining a price.

1. The first approach uses the two following formulas:

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling, General, and Administrative Expenses}}{\text{Total Production Costs}}$$

$$\text{Gross Margin-Based Price} = \text{Total Production Costs per Unit} + (\text{Markup Percentage} \times \text{Total Production Costs per Unit})$$

For Bookit Company, the markup percentage and selling price are computed as follows:

$$\text{Markup Percentage} = \frac{\$110,625 + \$132,750}{\$354,000}$$

$$= 68.75\%$$

$$\text{Gross Margin-Based Price} = \$24.00 + (68.75\% \times \$24.00)$$

$$= \underline{\underline{\$40.50}}$$

The numerator in the markup percentage formula is the sum of the desired profit (\$110,625) and the total selling, general, and administrative expenses (\$132,750). The denominator contains all production costs: variable costs of \$199,125 and fixed production costs of \$154,875. The gross margin markup is 68.75 percent of total production costs, or \$16.50. Adding \$16.50 to the total production costs per unit yields a selling price of \$40.50.

- The second way to express the gross margin-based price is to state the formula in terms of a company's desire to recover all of its costs and make a profit. This approach ignores the computation of the markup percentage, achieves the same gross margin-based price, and is stated as follows:

$$\text{Gross Margin-Based Price} = \frac{\text{Total Production Costs} + \text{Total Selling, General, and Administrative Expenses} + \text{Desired Profit}}{\text{Total Units Produced}}$$

Using this formula, the gross margin-based price for Bookit Company is computed as follows:

$$\begin{aligned} \text{Gross Margin-Based Price} &= \frac{\$354,000 + \$132,750 + \$110,625}{14,750 \text{ Units}} \\ &= \$597,375 \div 14,750 \\ &= \underline{\underline{\$40.50}} \end{aligned}$$

Study Note

Gross margin-based price per unit equals total production, selling, general, and administrative costs per unit plus a desired profit per unit.

- The third way the gross margin-based price can be determined is on a per unit basis:

$$\begin{aligned} \text{Gross Margin-Based Price} &= \text{Direct Materials} + \text{Direct Labor} \\ &\quad + \text{Variable Overhead} + \text{Fixed Overhead} \\ &\quad + \text{Selling, General, and Administrative Expenses} \\ &\quad + \text{Desired Profit per Unit} \end{aligned}$$

Applying this formula to Bookit Company's data, the computations are as follows:

$$\begin{aligned} \text{Gross Margin-Based Price} &= \$6.00 + \$4.50 + \$3.00 + \$10.50 + \$5.00 \\ &\quad + \$2.50 + \$1.50 + (\$110,625 \div 14,750) \\ &= \underline{\underline{\$40.50}} \end{aligned}$$

Return on Assets Pricing

Return on assets pricing focuses on earning a specified rate of return on the assets employed in the operation. This changes the objective of the price determination process from earning a return on the income statement to earning a return on the business's resources on the balance sheet. Because this approach focuses on a desired minimum rate of return on assets, it is also known as the *balance sheet approach to pricing*.

Return on Assets Calculations There are two formulas to finding the return on assets price:

- Return on Assets-Based Price = Total Costs and Expenses per Unit
+ (Desired Rate of Return
× Cost of Assets Employed per Unit)

Study Note

The return on assets pricing method is also known as the *balance sheet method*.

$$2. \text{ Return on Assets-Based Price} = [(\text{Total Production Costs} + \text{Total Selling, General, and Administrative Expenses}) \div \text{Units to Be Produced}] + [\text{Desired Rate of Return} \times (\text{Total Cost of Assets Employed} \div \text{Units to Be Produced})]$$

Recall that Bookit Company has an asset base of \$921,875. It plans to produce 14,750 units and would like to earn a 14 percent return on assets. If the company uses return on assets pricing, the selling price per unit would be calculated as follows:

$$\begin{aligned} \text{Return on Assets-Based Price} &= \$24.00 + \$9.00 \\ &\quad + [14\% \times (\$921,875 \div 14,750)] \\ &= \underline{\underline{\$41.75}} \end{aligned}$$

or as

$$\begin{aligned} \text{Return on Assets-Based Price} &= [(\$354,000 + \$132,750) \div 14,750] \\ &\quad + [14\% \times (\$921,875 \div 14,750)] \\ &= \$33.00 + \$8.75 \\ &= \underline{\underline{\$41.75}} \end{aligned}$$

Summary of Cost-Based Pricing Methods

Figure 12-3 summarizes the two cost-based pricing methods. If Bookit Company uses return on assets pricing and has a desired rate of return of 14 percent, it will need to set a higher selling price (\$41.75) than it would under the gross margin method (\$40.50).

Companies select their pricing methods based on their degree of trust in a cost base. The cost bases from which they can choose are (1) total product costs per unit and (2) total costs and expenses per unit.

- ▶ Often, total product costs per unit are readily available, which makes gross margin pricing a good way to compute selling prices. However, gross margin pricing depends on an accurate forecast of units because the fixed cost per unit portion of total production costs will vary if the actual number of units produced differs from the estimated number of units.
- ▶ Return on assets pricing is also a good pricing method if the assets used to manufacture a product can be identified and their cost determined. If this is not the case, the method yields inaccurate results.



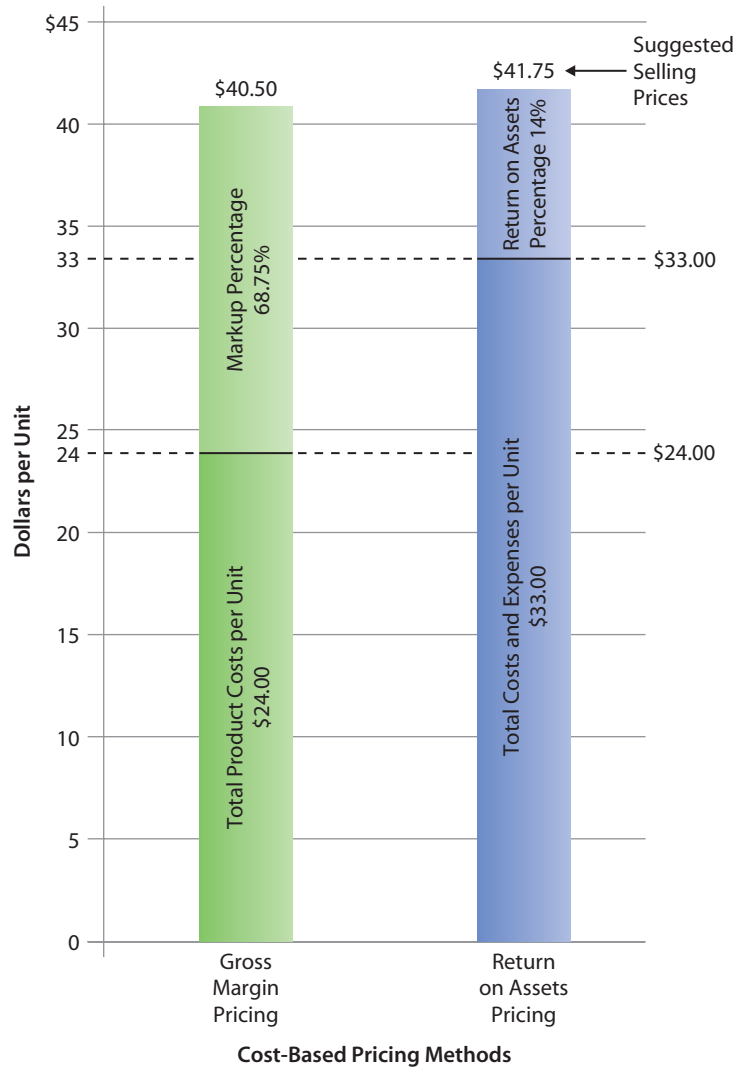
FOCUS ON BUSINESS PRACTICE

Pricing a Six-Pack

The average cost of a six-pack of beer continues to rise. That's because **Anheuser-Busch**, maker of Bud Light and Budweiser—the world's largest-selling brands of beer—

generally raises prices to keep pace with the consumer price index, and competitors have historically followed the company's price lead.¹

FIGURE 12-3
 Cost-Based Pricing Methods:
 Bookit Company



Pricing Services

A service business’s approach to pricing differs from that of a manufacturer. Although a service has no physical substance, it must still be priced and billed to the customer. Most service organizations use a form of **time and materials pricing** (also known as *parts and labor pricing*) to arrive at the price of a service. With this method, service companies, such as appliance repair shops, home-remodeling specialists, and automobile repair shops, arrive at prices by using two computations: one for direct labor and one for materials and parts. Markup percentages are added to the costs of materials and labor to cover the cost of overhead and provide a profit factor. If the service does not require materials and parts, then only direct labor costs are used in developing the price. Professionals, such as attorneys, accountants, and consultants, apply a factor representing all overhead costs to the base labor costs to establish a price for their services.

Study Note

Time and materials pricing is also known as *parts and labor pricing*.

Time and Materials Price Calculation The formula used in time and materials pricing is as follows:

$$\text{Time and Materials Price} = \text{Material Cost per Unit} + \left(\frac{\text{Markup \%}}{100} \times \text{Material Cost per Unit} \right) + \text{Labor Cost per Unit} + \left(\frac{\text{Markup \%}}{100} \times \text{Labor Cost per Unit} \right)$$

To illustrate, suppose that the owner of an auto repair shop has just completed work on a customer’s car. The parts used to repair the vehicle cost \$840. The company’s 40 percent markup rate on parts covers parts-related overhead costs and profit. The repairs required 4 hours of labor by a certified repair specialist, whose wages are \$35 per hour. The company’s overhead markup rate on labor is 80 percent. The repair shop will compute the bill as follows:

Repair parts used	\$840	
Overhead charges: \$840 × 40%	336	
Total parts charges	\$1,176	
Labor charges		
4 hours @ \$35 per hour	\$140	
Overhead charges: \$140 × 80%	112	
Total labor charges	252	
Total billing		\$1,428

Factors Affecting Cost-Based Pricing Methods

In some areas of the economy, such as government contracts, cost-based pricing is widely used. Although a variety of cost-based methods may be used to mechanically compute a price, many factors external to the product or service still require a manager’s attention. Once a cost-based price has been determined, the decision maker must consider such factors as competitors’ prices, customers’ expectations, and the cost of substitute products and services. Pricing is a risky part of operating a business, and care must be taken when establishing that all-important selling price.

Auto repair shops commonly use time and materials pricing (also called parts and labor pricing). This method involves computing the costs of direct labor and materials and adding percentage markups to those costs to cover overhead and provide a profit factor.

Courtesy of Kathy Wynn/Dreamstime.





Gillson Industries has just patented a new product called Gleam, an automobile wax for lasting protection against the elements. The company's controller has developed the following annual information for use in price determination meetings:

Variable production costs	\$1,110,000
Fixed overhead	540,000
Selling expenses	225,000
General and administrative expenses	350,000
Desired profit	250,000
Cost of assets employed	1,000,000

Annual demand for the product is expected to be 250,000 cans. On average, the company now earns a 10 percent return on assets.

1. Compute the projected unit cost for one can of Gleam.
2. Using gross margin pricing, compute the markup percentage and selling price for one can.
3. Using return on assets pricing, compute the unit price for one can.

SOLUTION

1. Unit cost computed:

Costs Categories	Total Projected Cost
Variable production costs	\$1,110,000
Fixed overhead	540,000
Total production costs	<u>\$1,650,000</u>
Selling expenses	\$ 225,000
General and administrative expenses	350,000
Total selling, general, and administrative expenses	<u>\$ 575,000</u>
Total costs and expenses	\$2,225,000
Units produced	250,000
Total cost per unit	<u><u>(\$2,225,000 ÷ 250,000 units) \$ 8.90</u></u>

2. Markup percentage and unit selling price computed, using gross margin pricing:

$$\begin{aligned} \text{Markup Percentage} &= \frac{\text{Desired Profit} + \text{Total Selling,} \\ &\quad \text{General, and Administrative Expenses}}{\text{Total Production Costs}} \\ &= \frac{\$250,000 + \$575,000}{\$1,650,000} = 50.0\% \end{aligned}$$

$$\begin{aligned} \text{Gross Margin-Based Price} &= \text{Total Production Costs per Unit} + (\text{Markup Percentage} \\ &\quad \times \text{Total Production Costs per Unit}) \\ &= (\$1,650,000 \div 250,000) + [50.0\% \times (\$1,650,000 \div 250,000)] \\ &= \underline{\underline{\$9.90}} \end{aligned}$$

3. Unit selling price computed using return on assets pricing:

$$\begin{aligned} \text{Return on Assets-Based Price} &= \text{Total Costs and Expenses per Unit} + (\text{Desired Rate of Return} \\ &\quad \times \text{Cost of Assets Employed per Unit}) \\ \text{Return on Assets-Based Price} &= \$8.90 + [10\% \times (\$1,000,000 \div 250,000)] \\ &= \$8.90 + \$0.40 \\ &= \underline{\underline{\$9.30}} \end{aligned}$$

Pricing Based on Target Costing

LO4 Describe target costing, and use that concept to analyze pricing decisions and evaluate a new product opportunity.

Study Note

Target costing is sometimes referred to as *target pricing*.

Study Note

Remember that when desired profit is defined as a percentage of target cost, target price is equal to 100 percent of target cost *plus* the percentage of target cost desired as profit.

Target costing is a pricing method designed to enhance a company's ability to compete, especially in markets for new or emerging products, such as the e-book readers described in this chapter's Decision Point. This approach to pricing differs significantly from the cost-based methods that we discussed in the last section.

Instead of first determining the cost of a product or service and then adding a profit factor to arrive at a price, target costing reverses the procedure. Target costing (1) identifies the price at which a product will be competitive in the marketplace, (2) defines the desired profit to be made on the product, and (3) computes the target cost for the product by subtracting the desired profit from the competitive market price.

Target Costing Calculation The formula used in target costing is as follows:

$$\text{Target Price} - \text{Desired Profit} = \text{Target Cost}$$

Once the target cost has been established, the company's engineers and product designers use it as the maximum cost to be incurred for the materials and other resources needed to design and manufacture the product. It is their responsibility to create the product at or below its target cost.

Pricing based on target costing may not seem revolutionary, but a detailed look at its underlying principles reveals its strategic superiority:

- ▶ Target costing gives managers the ability to control or dictate the costs of a new product at the planning stage of the product's life cycle.
- ▶ In a competitive environment, the use of target costing enables managers to analyze a product's potential before they commit resources to its production.

Figure 12-4 compares the timing of a pricing decision that uses a traditional approach with one that uses target costing. The stages of the product life cycle, from the generation of the product idea to the final disposition of the product, are identified at the base of the figure.

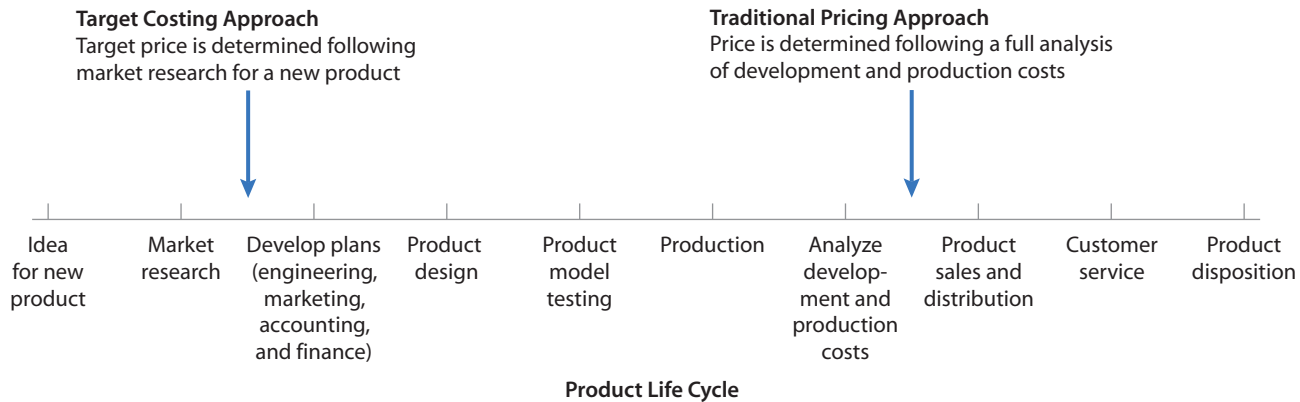
- ▶ When traditional cost-based pricing practices are used, prices cannot be set until production has taken place and costs have been incurred and analyzed. At that point, a profit factor is added to the product's cost, and the product is ready to be offered to customers.
- ▶ In contrast, under target costing, the pricing decision takes place immediately after the market research for a new product. The market research not only reveals the potential demand for the product but also identifies the maximum price that a customer would be willing to pay for it. Once the price is determined, target costing enables the company's engineers to design the product with a fixed maximum target cost on which to base the product's features.

Differences Between Cost-Based Pricing and Target Costing

One of the primary benefits of using target costing is the ability to design and build a product to a specific cost goal. The increased emphasis on product design allows a company to engineer the target cost into the product before manufacturing begins. A new product is designed only if its projected costs are equal to or lower than its

FIGURE 12-4

Comparison of Price Decision Timing



target cost. The company can thus focus on holding costs down while it plans and designs the product, before the costs are actually committed and incurred.

- ▶ **Committed costs** are the costs of design, development, engineering, testing, and production that are engineered into a product or service at the design stage of development.
- ▶ **Incurred costs** are the actual costs incurred in making the product.

When cost-based pricing is used, it is very difficult to control costs from the planning phase through the production phase. Under that approach, concern about reducing costs begins only after the product has been produced. This often leads to random efforts to cut costs, which can reduce product quality and further erode the customer base. Under target costing, the product is expected to produce a profit as soon as it is marketed. Cost-cutting improvements in a product's design and production methods can still be made, but profitability is built into the selling price from the beginning.

These shoppers at an **Ikea** store have a large selection of high-quality products to choose from. Target costing enables Ikea to offer its products at competitive prices and ensures that a product will earn a profit as soon as it is introduced. This method identifies the price at which a product will be competitive in the marketplace, defines the desired profit to be made on the product, and computes the target cost by subtracting the desired profit from the competitive market price.

Courtesy of AP Photo/Carlos Osorio



Companies like **Sony** and **Ikea** have used target costing successfully for years and have benefited from increased sales volume each time they have cut prices because of production improvements. These companies never sacrifice product quality.

Target Costing Analysis in an Activity-Based Management Environment

Study Note

Activity-based management (ABM) can be used successfully with target costing.

To see how a company that uses activity-based management implements target costing, consider Elsinore Company's approach to new product decisions. A customer is seeking price quotations for a special-purpose router and a wireless palm-sized tablet computer. The current market-price ranges for the two products are as follows: router, \$320–\$380 per unit; and tablet computer, \$750–\$850 per unit.

One of Elsinore's sales persons thinks that if the company could quote prices of \$300 for the router and \$725 for the tablet computer, it would get the order and gain a significant share of the market for those products. Elsinore's usual profit markup is 25 percent of total unit cost.

The company's design engineers and accountants put together these specifications and costs for the new products:

Activity-based cost rates		
Materials handling	\$ 1.30	per dollar of direct materials and purchased parts cost
Production	\$ 3.50	per machine hour
Product delivery	\$24.00	per router
	\$30.00	per computer
	<i>Router</i>	<i>Computer</i>
Projected unit demand	26,000	18,000
Per-unit data		
Direct materials cost	\$25.00	\$65.00
Purchased parts cost	\$15.00	\$45.00
Manufacturing labor		
Hours	2.6	4.8
Hourly labor rate	\$12.00	\$15.00
Assembly labor		
Hours	3.4	8.2
Hourly labor rate	\$14.00	\$16.00
Machine hours	12.8	28.4

The three steps used in arriving at the target cost are as follows:

1. **Find the target cost per unit.** The target cost for each product is computed as follows:

$$\text{Router} = \$300.00 \div 1.25 = \$240.00^*$$

$$\text{Computer} = \$725.00 \div 1.25 = \$580.00$$

*Target Price – Desired Profit = Target Cost

$$\$300.00 - 0.25X = X$$

$$\$300.00 = 1.25X$$

$$X = \frac{\$300.00}{1.25} = \underline{\underline{\$240.00}}$$

2. *Find the projected unit cost.* The projected total unit cost of production and delivery is computed in the following way:

	<i>Router</i>	<i>Computer</i>
Direct materials cost	\$ 25.00	\$ 65.00
Purchased parts cost	<u>15.00</u>	<u>45.00</u>
Total cost of direct materials and parts	\$ 40.00	\$110.00
Manufacturing labor		
Router (2.6 hours × \$12.00)	31.20	
Computer (4.8 hours × \$15.00)		72.00
Assembly labor		
Router (3.4 hours × \$14.00)	47.60	
Computer (8.2 hours × \$16.00)		131.20
Activity-based costs		
Materials handling		
Router (\$40.00 × \$1.30)	52.00	
Computer (\$110.00 × \$1.30)		143.00
Production		
Router (12.8 machine hours × \$3.50)	44.80	
Computer (28.4 machine hours × \$3.50)		99.40
Product delivery		
Router	24.00	
Computer		<u>30.00</u>
Projected total unit cost	<u>\$239.60</u>	<u>\$585.60</u>

3. *Make a decision.* Using the target costing approach and the following data, we can determine whether Elsinore Company should produce the new products:

	<i>Router</i>	<i>Computer</i>
Target unit cost	\$240.00	\$580.00
Less projected unit cost	<u>239.60</u>	<u>585.60</u>
Difference	<u>\$ 0.40</u>	<u>(\$ 5.60)</u>

The router can be produced below its target cost, so it should be produced. As currently designed, the tablet computer cannot be produced at or below its target cost, so Elsinore should either redesign it or drop plans to produce it.

STOP & APPLY >

Success Ltd. is considering a new product and must make a go or no-go decision when its planning team meets tomorrow. Market research shows that the unit selling price that would be agreeable to potential customers is \$1,000, and the company's desired profit is 25 percent of target cost. The design engineer's preliminary estimate of the product's design, production, and distribution costs is \$775 per unit. Using target costing, determine whether the company should market the new product.

SOLUTION

The company should market the new product. The target cost for the product is \$800 ($\$1,000 \div 1.25$). The engineer's projected cost is \$775, or \$25 below the amount needed to earn the desired profit.

Pricing for Internal Providers of Goods and Services

L05 Describe how transfer pricing is used for transferring goods and services and evaluating performance within a division or segment.

Study Note

Transfer pricing is not used for external pricing; it is used to set prices for transfers among a company's departments, divisions, or segments.

Study Note

Cost-plus transfer pricing is similar to the gross margin pricing method.

Study Note

The market transfer price is also called the *external market price*.

So far in this chapter, we have focused on how a company sets prices for consumers outside the organization. We now turn our focus to the inside of an organization and look at how it prices its products and services for internal transfers between divisions or segments.

As a business grows, its day-to-day operations often become too complex to be managed by a single person. To make operations more manageable, the business is usually organized into divisions or operating segments, and a separate manager is assigned to control the operations of each segment. Such a business is called a **decentralized organization**. Each division or segment often sells its goods and services both inside and outside the organization.

For example, the beverage division of **Pepsico** sells its Pepsi drink products to internal customers like KFC and Taco Bell restaurants. It also sells to external customers like **Safeway** and **Wal-Mart**. And **Anheuser-Busch**'s beer segment produces and sells its products internally to Sea World amusement parks, as well as externally to unrelated entities like airlines and grocery stores.

Transfer Pricing

When divisions or segments within a company exchange goods or services and assume the role of customer or supplier for each other, they use transfer prices. A **transfer price** is the price at which goods and services are charged and exchanged between a company's divisions or segments. Transfer prices are an internal pricing mechanism that allows transactions between divisions or segments of a business to be measured and accounted for.

- ▶ Transfer prices affect the revenues and costs of the divisions involved.
- ▶ They do not affect the revenues and costs of the company as a whole.

The transfer price just shifts part of the profits from the divisions or centers that externally charge for their goods or services to the divisions or centers that do not externally bill for their services and products. Transfer pricing enables a business to assess both the internal and the external profitability of its products or services. The three basic kinds of transfer prices are cost-plus transfer prices, market transfer prices, and negotiated transfer prices.

Cost-Plus Transfer Price A **cost-plus transfer price** is based on either the full cost or the variable costs incurred by the producing division plus an agreed-on profit percentage. The weakness of the cost-plus pricing method is that cost recovery is guaranteed to the selling division. Guaranteed cost recovery prevents the company from detecting inefficient operating conditions and the incurrence of excessive costs, and it may even inappropriately reward inefficient divisions that incur excessive costs. This reduces overall company profitability and shareholder value.

Market Transfer Price A **market transfer price** is based on the price that could be charged if a segment could buy from or sell to an external party. Some experts believe that the use of a market transfer price is preferable to the other methods. It forces the division that is "selling," or transferring, the product or service to another division to be competitive with market conditions, and it does not penalize the "buying," or receiving, division by charging it a higher price than it would have to pay if it bought from outside the firm.

However, using market prices may lead the selling division to ignore negotiation attempts from the buying division manager and to sell directly to outside

customers. If this causes an internal shortage of materials and forces the buying division to purchase materials from the outside, overall company profits may decline even if the selling division makes a profit. Such use of market prices works against a company’s overall operating objectives. Therefore, when market prices are used to develop transfer prices, they are usually used only as a basis for negotiation.

Study Note

A negotiated transfer price is often used for internal pricing.

Negotiated Transfer Price A negotiated transfer price is arrived at through bargaining between the managers of the buying and selling divisions or segments. Such a transfer price may be based on an agreement to use a cost plus a profit percentage. The negotiated price will be between the negotiation floor (the selling division’s variable cost) and the negotiation ceiling (the market price). This approach allows for cost recovery while still allowing the selling division to return a profit.

Developing a Transfer Price

To illustrate the development of the three kinds of transfer prices, let’s consider the Simple Box Company, a firm that makes cardboard boxes. As shown in Figure 12-5, this company has two divisions: the Pulp Division and the Cardboard Division. The Pulp Division produces pulp for the Cardboard Division. The Cardboard Division may also purchase pulp from outside suppliers. Exhibit 12-1 shows the development of a cost-plus transfer price for the Pulp Division. The Pulp Division’s manager has created a one-year budget based on the expectation that the Cardboard Division will require 480,000 pounds of pulp. Unit costs appear in the last column of Exhibit 12-1.

Cost-Plus Transfer Price Notice that allocated corporate overhead is not included in the computation of the transfer price. Only the variable costs of \$11.85 ($\$3.30 + \$0.70 + \$1.60 + \$2.40 + \$1.90 + \1.95) and the fixed cost of \$1.05 related to the Pulp Division are included. The profit markup of 10 percent adds \$1.29, producing the final cost-plus transfer price of \$14.19.

Market Value Price Management could now dictate that the \$14.19 price be used. However, the Cardboard Division’s manager could point out that it is possible to purchase pulp from an outside supplier for \$13.00 per pound. Use of the \$13.00 price would represent a market value approach.

FIGURE 12-5
Transfer Price Alternatives at Simple Box Company

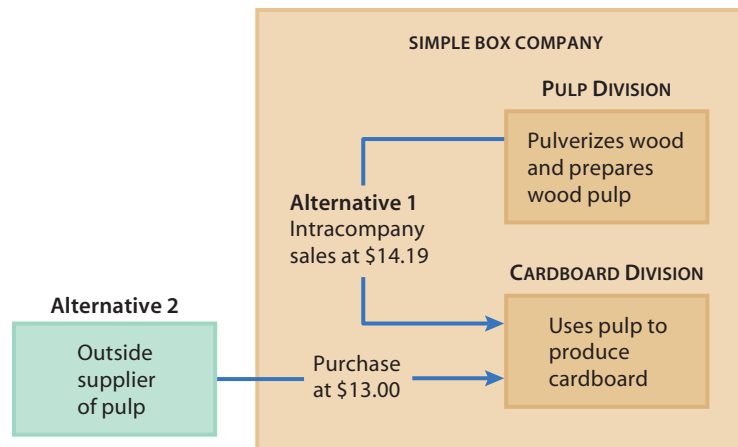


EXHIBIT 12-1
Transfer Price Computation

Simple Box Company		
Pulp Division—Transfer Price Computation		
Cost Categories	Budgeted Costs	Cost per Unit
Direct materials		
Wood	\$1,584,000	\$ 3.30
Scrap wood	336,000	0.70
Direct labor		
Shaving/cleaning	768,000	1.60
Pulverizing	1,152,000	2.40
Blending	912,000	1.90
Overhead		
Variable	936,000	1.95
Fixed	504,000	1.05
Subtotals	\$6,192,000	\$12.90
Costs allocated from corporate office	144,000	
Target profit, 10% of division's costs	619,200	1.29
Total costs and profit	<u>\$6,955,200</u>	
Cost-plus transfer price		<u>\$14.19</u>

Negotiated Transfer Price The best solution might be to agree on a negotiated transfer price between the variable costs of \$11.85, the floor, and the outside market price of \$13.00, the ceiling. The negotiation process will facilitate each manager's role in maximizing companywide profits and controlling his or her division's costs. Many times, the managers will split the difference and negotiate a price of \$12.43* $[(\$11.85 + \$13.00)/2]$.

*Rounded.

Other Transfer Price Issues

In this example, both managers brought their concerns to the attention of top management, and a settlement was reached. The negotiated transfer price allows for the sharing of the final product's companywide profits between the divisions when the boxes are sold on the outside market. Such an approach is often used to maintain harmony within an organization.

Additional issues may arise if the Cardboard Division chooses to purchase from outside suppliers. Because the Pulp Division has adequate capacity to fulfill the Cardboard Division's demands, it should sell to that division at any price that recovers its incremental costs. The incremental costs of intracompany sales include all variable costs of production and distribution plus any avoidable fixed costs that are directly traceable to intracompany sales. If the Cardboard Division can acquire products from outside suppliers at an annual cost that is less than the Pulp Division's incremental costs, then purchases should be made from the outside supplier because it will enhance the company's overall profits. Before making such a decision, a thorough analysis of the Pulp Division's operations should be conducted.

Study Note

The use of transfer pricing encourages accountability for seller-customer relationships.

Using Transfer Prices to Measure Performance

Because a transfer price contains an estimated amount of profit, a manager's ability to meet a targeted profit can be measured. Although transfer prices are often

EXHIBIT 12-2

Performance Report Using Transfer Prices

Simple Box Company			
Pulp Division—Performance Report			
For March			
	Budget	Actual	Difference Under/(Over) Budget
Sales to Carboard Division (42,000 lbs.)	<u>\$546,000</u>	<u>\$546,000</u>	<u>\$ 0</u>
Costs Controllable by Manager			
Cost of goods sold			
Direct materials			
Wood	\$138,600	\$140,250	(\$1,650)
Scrap wood	29,400	29,750	(350)
Direct labor			
Shaving/cleaning	67,200	68,000	(800)
Pulverizing	100,800	102,000	(1,200)
Blending	79,800	80,750	(950)
Overhead			
Variable	81,900	82,875	(975)
Fixed	<u>44,100</u>	<u>44,100</u>	<u>—</u>
Total cost of goods sold	<u>\$541,800</u>	<u>\$547,725</u>	<u>(\$5,925)</u>
Gross margin from sales	\$ 4,200	(\$ 1,725)	\$5,925
Costs Uncontrollable by Manager			
Cost allocated from corporate office	<u>12,600</u>	<u>12,600</u>	<u>—</u>
Operating (loss)	<u>(\$ 8,400)</u>	<u>(\$ 14,325)</u>	<u>\$5,925</u>

called *artificial* or *created* prices, they and their related policies are closely connected with performance evaluation.

When transfer prices are used, a division can be evaluated as a profit center, even if it does not sell to outsiders, because using transfer prices to value the division's output creates simulated revenues for the division. The operating income calculated in this way is not based on real sales to outsiders and is thus artificial. However, it is a valuable performance measure if the transfer prices are realistic and are determined using the methods described in this chapter.

Exhibit 12-2 shows a performance report for the Pulp Division of the Simple Box Company. The Pulp Division produced and transferred 42,000 pounds as budgeted at a negotiated transfer price of \$13.00 per pound. The budgeted costs are based on the costs per unit in Exhibit 12-1. The performance report in Exhibit 12-2 shows that the Pulp Division's actual gross margin was (\$1,725), whereas the budgeted gross margin was \$4,200. The difference of \$5,925 stems from cost overages in various materials, labor, and variable overhead accounts. Those differences will need to be investigated, as they would be for any division.

The use of transfer prices to simulate revenues, however, allows further evaluation. For instance, the measures of operating income (loss) can be compared with the amount of capital the company has invested in the Pulp Division to determine whether the division is making an adequate return on the company's investment, and the impact on the division of uncontrollable costs from the corporate office can be assessed.

STOP & APPLY >

The Molding Process Division at Trophy Products has been treated as a cost center since the company was founded in 1968. Recently, management decided to change the performance evaluation approach and treat the company's processing divisions as profit centers. Each division is expected to earn a 20 percent profit on its total production costs. One of Trophy's products is a plastic base for a display chest. The Molding Process Division supplies this base to the Cabinet Process Division, and it also sells the base to another company. Molding's total production cost for the base is \$27.40. It sells the base to the other company for \$38.00. What should the transfer price for the plastic base be?

SOLUTION

In addition to the traditional approaches of transferring the product from one process to the next at variable or full cost, management should consider the following three options when setting the transfer price for the plastic base:

Cost plus profit: $\$27.40 + (\$27.40 \times 20\%) = \$32.88$
 Market price: \$38.00
 Negotiated price: Any price between \$32.88 and \$38.00

Managers of the Molding Process Division have the option of selling the division's output to the outside company and earning more than the 20 percent minimum return. They should also be able to earn more than 20 percent internally. A price at the midpoint of the negotiated price range seems to be fair, \$35.44.

A LOOK BACK AT ▶ LAB 126

In this chapter's Decision Point, we asked the following questions:

- Why do managers generally use several pricing approaches?
- Why might **Lab 126's** managers use target costing to establish a price for the Kindle?

As you learned in this chapter, no one pricing method is superior, because each business and market segment differs. Successful managers, like those at Lab 126, therefore generally use several pricing approaches.

Early in the e-book reader market, there was little competition, and new models may have been priced to recover the product's cost and earn a certain amount of profit. Now that new products with desirable features, such as text-to-speech, are being introduced and the market has become very competitive, Lab 126's managers might use target costing to set a price for a new reader. To do so, they would subtract their desired profit from the proposed market price to arrive at the maximum target cost. A team of engineering, accounting, and sales managers would then analyze each proposed product feature to verify that the product could be designed and manufactured at or below the target cost.

**Review Problem****Gross Margin Pricing**
LO3

Suppose that The Undercovers Company makes a complete line of covers for e-book readers like the Kindle, including a plain cover, a deluxe cover, and a trendy cover. The covers are produced on an assembly line, beginning with the Stamping Department and continuing through the Sewing, Detailing, and Packaging departments. The projected costs of each cover and the percentages for assigning unavoidable fixed and common costs are as follows:

Cost Categories	Total			
	Projected Costs	Plain Cover	Deluxe Cover	Trendy Cover
Direct materials				
Leather	\$137,000	\$62,500	\$29,000	\$45,500
Magnet	5,250	2,500	1,000	1,750
Clip	9,250	3,750	2,000	3,500
Package	70,500	30,000	16,000	24,500
Direct labor				
Stamping	53,750	22,500	12,000	19,250
Sewing	94,000	42,500	20,000	31,500
Detailing	107,500	45,000	24,000	38,500
Packaging	44,250	17,500	11,000	15,750
Indirect labor	173,000	77,500	36,000	59,500
Operating supplies	30,000	12,500	7,000	10,500
Variable overhead	90,500	40,000	19,000	31,500
Fixed overhead	120,000	45%	25%	30%
Distribution expenses	105,000	40%	20%	40%
Variable marketing expenses	123,000	\$55,000	\$26,000	\$42,000
Fixed marketing expenses	85,400	40%	25%	35%
General and administrative expenses	47,600	40%	25%	35%

The Undercovers Company's policy is to earn a minimum of 30 percent over total cost on each type of cover produced. Expected sales for the year are: plain, 50,000 units; deluxe, 20,000 units; and trendy, 35,000 units. Assume no change in inventory levels, and round all answers to two decimal places.

Required

1. Using the gross margin pricing method, compute the selling price for each kind of cover.
2. The competition is selling a similar plain cover for around \$14. Should this influence Undercover's pricing decision? Give reasons for your answer.

Answers to Review Problem

Before the selling prices are computed, the cost analysis must be completed and restructured to supply the information that is required for the pricing computations.

Cost Categories	Total			
	Projected Costs	Plain Cover	Deluxe Cover	Trendy Cover
Total direct materials	\$ 222,000	\$ 98,750	\$ 48,000	\$ 75,250
Total direct labor	299,500	127,500	67,000	105,000
Indirect labor	173,000	77,500	36,000	59,500
Operating supplies	30,000	12,500	7,000	10,500
Variable overhead	90,500	40,000	19,000	31,500
Fixed overhead	120,000	54,000	30,000	36,000
Total production costs	<u>\$ 935,000</u>	<u>\$410,250</u>	<u>\$207,000</u>	<u>\$317,750</u>
Distribution expenses	\$ 105,000	\$ 42,000	\$ 21,000	\$ 42,000
Variable marketing expenses	123,000	55,000	26,000	42,000
Fixed marketing expenses	85,400	34,160	21,350	29,890
General and administrative expenses	47,600	19,040	11,900	16,660
Total selling, general, and administrative expenses	<u>\$ 361,000</u>	<u>\$150,200</u>	<u>\$ 80,250</u>	<u>\$130,550</u>
Total costs	<u>\$1,296,000</u>	<u>\$560,450</u>	<u>\$287,250</u>	<u>\$448,300</u>
Desired profit (30%)	<u>\$ 388,800</u>	<u>\$168,135</u>	<u>\$ 86,175</u>	<u>\$134,490</u>

1. Pricing using the gross margin approach:

Markup percentage formula:

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling, General, and Administrative Expenses}}{\text{Total Production Costs}}$$

Gross margin pricing formula:

$$\text{Gross Margin-Based Price} = \text{Total Production Costs per Unit} + (\text{Markup Percentage} \times \text{Total Production Costs per Unit})$$

$$\text{Plain: Markup Percentage} = \frac{\$168,135 + \$150,200}{\$410,250} = 77.60\%^*$$

$$\text{Gross Margin-Based Price} = (\$410,250 \div 50,000) + [77.60\% \times (\$410,250 \div 50,000)] = \underline{\underline{\$14.57^*}}$$

$$\text{Deluxe: Markup Percentage} = \frac{\$86,175 + \$80,250}{\$207,000} = 80.40\%^*$$

$$\text{Gross Margin-Based Price} = (\$207,000 \div 20,000) + [80.40\% \times (\$207,000 \div 20,000)] = \underline{\underline{\$18.67^*}}$$

$$\text{Trendy: Markup Percentage} = \frac{\$134,490 + \$130,550}{\$317,750} = 83.41\%^*$$

$$\text{Gross Margin-Based Price} = (\$317,750 \div 35,000) + [83.41\% \times (\$317,750 \div 35,000)] = \underline{\underline{\$16.65^*}}$$

2. Competition's influence on price: If the quality and design of the competition's plain cover are similar to those of Undercovers' plain cover, Undercovers' management should consider reducing the price of its cover to the \$14.00 range. At \$14.57, Undercover has a 30 percent profit built into its price. The plain cover's breakeven is at \$11.21* ($\$14.57 \div 1.3$). Therefore, the company could reduce its price below the competitor's price and still make a significant profit.

*Rounded.

STOP & REVIEW >

LO1 Identify the objectives and rules used to establish prices of goods and services, and relate pricing issues to the management process.

A company's long-run objectives should include statements on pricing policy. Possible pricing policy objectives include (1) identifying and adhering to both short-run and long-run pricing strategies, (2) maximizing profits, (3) maintaining or gaining market share, (4) setting socially responsible prices, (5) maintaining a minimum rate of return on investment, and (6) being customer focused.

During the management process, managers keep the following points in mind: a product's or service's selling price must (1) be competitive with the competition's price, (2) be acceptable to the customer, (3) recover all costs incurred in bringing the product or service to market, and (4) return a profit. If a manager deviates from any of these four pricing rules, there must be a specific short-run objective that accounts for the change. Breaking those pricing rules for a long period of time will force a company into bankruptcy.

LO2 Describe economic pricing concepts, including the auction-based pricing method used on the Internet.

The economic approach to pricing is based on microeconomic theory. Microeconomic theory states that profits will be maximized when the difference between total revenue and total cost is greatest. Total revenue then increases more slowly, because as a product is marketed, price reductions are necessary to sell more units. Total cost increases when larger quantities are produced because fixed costs change. To locate the point of maximum profit, marginal revenue and marginal cost must be computed and plotted. Profit is maximized at the point where the marginal revenue and marginal cost curves intersect. Auction-based pricing is growing in importance as a pricing mechanism as more companies and individuals are conducting business over the Internet. Basically, the Internet allows sellers and buyers to solicit bids and transact exchanges in an open market environment. An auction-based price is set by a willing buyer and seller in a sales transaction.

LO3 Use cost-based pricing methods to develop prices.

Cost-based pricing methods include gross margin pricing and return on assets pricing. Under these two methods, a markup representing a percentage of production costs or a desired rate of return is added to the total costs. A pricing method often used by service businesses is time and materials pricing. Although managers may depend on one or two traditional approaches to pricing, they often also factor in their own experience.

LO4 Describe target costing, and use that concept to analyze pricing decisions and evaluate a new product opportunity.

Target costing enhances a company's ability to compete in the global marketplace. Instead of first determining the cost of a product and then adding a profit factor to arrive at its price, target costing reverses the procedure. Target costing (1) identifies the price at which a product will be competitive in the marketplace, (2) defines the desired profit to be made on the product, and (3) computes the target cost for the product by subtracting the desired profit from the competitive market price. Target costing gives managers the ability to control or dictate the costs of a new product at the planning stage; under a traditional pricing system, managers cannot control costs until after the product has been manufactured. To identify a new product's target cost, the following formula is applied:

$$\text{Target Price} - \text{Desired Profit} = \text{Target Cost}$$

The target cost is then given to the engineers and product designers, who use it as a maximum cost to be incurred for materials and other resources needed to design and manufacture the product. It is their responsibility to create the

product at or below its target cost. Sometimes, the cost requirements cannot be met. In such a case, the organization should try to adjust the product's design and the approach to production. If those attempts fail, the organization should either invest in new equipment and procedures or abandon its plans to market the product.

LO5 Describe how transfer pricing is used for transferring goods and services and evaluating performance within a division or segment.

A transfer price is the price at which goods and services are charged and exchanged between a company's divisions or segments. There are three primary approaches to developing transfer prices: (1) the price may be based on the cost of the item up to the point at which it is transferred to the next department or process; (2) the price may be based on market value if the item has an existing external market; or (3) the price may be negotiated by the managers of the buying and selling divisions. A cost-plus transfer price is the sum of costs incurred by the producing division plus an agreed-on profit percentage. A market-based transfer price is based on external market prices. In most cases, a negotiated transfer price is used, that is, a price is reached through bargaining between the managers of the selling and buying divisions. A division's performance may be evaluated by using transfer prices as the basis for determining revenues.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Auction-based pricing 477 (LO2)

Committed costs 486 (LO4)

Cost-plus transfer price 489 (LO5)

Decentralized organization 489 (LO5)

Gross margin pricing 479 (LO3)

Incurred costs 486 (LO4)

Marginal cost 477 (LO2)

Marginal revenue 477 (LO2)

Market transfer price 489 (LO5)

Negotiated transfer price 490 (LO5)

Return on assets pricing 480 (LO3)

Target costing 485 (LO4)

Time and materials pricing 482 (LO3)

Transfer price 489 (LO5)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge And Skills

Short Exercises

L01 Rules for Establishing Prices

SE 1. Jason Kellam is planning to open a pizza restaurant next month in Flora, Alabama. He plans to sell his large pizzas for a base price of \$18 plus \$2 for each topping selected. When asked how he arrived at the base price, he said that his cousin developed that price for his pizza restaurant in New York City. What pricing rules has Jason Kellam not followed?

L01 External Factors That Influence Prices

SE 2. Your client is about to introduce a very high-quality product that will remove an invasive form of pepper bush in the southern United States. The Marketing Department has established a price of \$37 per gallon, and the company controller has projected total production, selling, and distribution costs of \$26 per gallon. What other factors should your client consider before introducing the product into the marketplace?

L02 Traditional Economic Pricing Concept

SE 3. You are to decide the total demand for a particular product. Assume that the product you are evaluating has the total cost and total revenue curves pictured in Figure 26-2A. Also assume that the difference between total revenue and total cost is the same at the 5,000- and 8,000-unit levels. If you had to choose between those two levels of activity as goals for total sales over the life of the product, which would you prefer? Why?

L03 Cost-Based Price Setting

SE 4. The Windwalker Company has collected the following data for one of its product lines: total production costs, \$300,000; total selling, general, and administrative expenses, \$112,600; desired profit, \$67,400; and production costs per unit, \$40. Using the gross margin pricing method, compute a suggested selling price for this product that would yield the desired profit.

L03 Pricing a Service

SE 5. Evan Nathan runs a home repair business. Recently he gathered the following cost information about the repair of a client's pool deck: replacement wood, \$650; deck screws and supplies, \$112; and labor, 12 hours at \$14 per hour. Nathan applies a 40 percent overhead rate to all direct costs of a job. Compute the total billing price for the repair of the pool deck.

L04 Committed Costs and Target Costing

SE 6. Nanci Osborne is a design engineer for Dash Enterprises. In a discussion about a proposed new product, Osborne stated that the product's projected target cost was \$6.50 below the committed costs identified by design estimates. Given this information, should the company proceed with the new product? Explain your answer, and include a definition of committed cost in your analysis.

L04 Pricing Using Target Costing

SE 7. JTZ Furniture is considering a new product and must make a go or no-go decision before tomorrow's planning team meeting. Market research shows

that the unit selling price agreeable to potential customers is \$1,600, and the company's desired profit is 22 percent of target cost. The design engineer's preliminary estimate of the product's design, production, and distribution costs is \$1,380 per unit. Using target costing, determine whether the company should market the new product.

L05 Decision to Use Transfer Prices

SE 8. The production process at Premier Castings includes eight processes, each of which is currently treated as a cost center with a specific set of operations to perform on each casting produced. Following the fourth process's operations, the rough castings have an external market. The fourth process must also supply the fifth process with its direct materials. The management of Premier Castings wants to develop a new approach to measuring process performance. Is Premier a candidate for using transfer prices? Explain your answer.

L05 Cost-Based Versus Market-Based Transfer Prices

SE 9. Refer to the information in **SE 8**. Should Premier Castings use economic-based, cost-based, market-based, or negotiated transfer prices?

L05 Developing a Negotiated Transfer Price

SE 10. The Cookie Dough Division at Sweet Products has been treated as a cost center since the company was founded. Recently, management decided to change the performance evaluation approach and treat its processing divisions as profit centers. Each division is expected to earn a 20 percent profit on its total production costs. One of Sweet's products is chocolate chip cookie dough. The Cookie Dough Division supplies this dough to the Packaged Cookies Division, and it also sells it to another company. Cookie Dough's total production cost for the dough is \$2.40 per pound. It sells the dough to the other company for \$5.00 a pound. What should the transfer price for a pound of cookie dough be?

Exercises

L01 Pricing Policy Objectives

E 1. Old Denim, Ltd., is an international clothing company that retails medium-priced goods. Its retail outlets are located throughout the United States, France, Germany, and Great Britain. Management wants to maintain the company's image of providing the highest possible quality at the lowest possible prices. Selling prices are developed to draw customers away from competitors' stores. First-of-the-month sales are regularly held at all stores, and customers are accustomed to this practice. Company buyers are carefully trained to seek out quality goods at inexpensive prices. Sales are targeted to increase a minimum of 5 percent per year. All sales should yield a 15 percent return on assets. Sales personnel are expected to wear Old Denim clothing while working, and all personnel can purchase clothing at 10 percent above cost. All stores are required to be clean and well organized. Competitors' prices are checked daily. Identify the pricing policy objectives of Old Denim, Ltd.

L01 External and Internal Pricing Factors

E 2. Mobile Battery features more than a dozen brands of batteries in many sizes. Two of the brands are PowerPlus and SuperPower. The following information about the two brands was obtained:

	PowerPlus	SuperPower
Selling price:		
Battery, installed	\$120	\$110
Cost per battery	100	70

As shown, selling prices include installation costs. Each battery costs \$10 to install.

1. Compute each brand's net unit selling price after installation.
2. Was cost the main consideration in setting those prices?
3. What other factors could have influenced those prices?

L02 Traditional Economic Pricing Theory

E 3. Texaza, a product design firm, has just completed a contract to develop a wireless phone keychain. The phone keychain needs to be recharged only once a week and can be used worldwide. Initial fixed costs for this product are \$4,000. The designers estimate that the product will break even at the \$5,000/100-unit mark. Total revenues will again equal total costs at the \$25,000/900-unit point. Marginal cost is expected to equal marginal revenue when 550 units are sold.

1. Sketch total revenue and total cost curves for this product. Mark the vertical axis at each \$5,000 increment and the horizontal axis at each 100-unit increment.
2. Based on your total revenue and total cost curves in **1**, at what unit selling price will profits be maximized?

L02 ebusiness

E 4. Visit the websites of Priceline.com and eBay.com. Write a brief comparison of each site's features. Which site do you prefer, and why?

L03 Price Determination

E 5. Turley Industries has just patented a new toothpaste called Sparkle for lasting protection against tooth decay. The company's controller has developed the following annual information for use in price determination meetings:

Variable production costs	\$ 900,000
Fixed overhead	500,000
Selling expenses	200,000
General and administrative expenses	125,000
Desired profit	375,000
Cost of assets employed	1,000,000

Annual demand for the product is expected to be 500,000 tubes. On average, the company now earns an 8 percent return on assets.

1. Compute the projected unit cost for one tube of Sparkle.
2. Using gross margin pricing, compute the markup percentage and selling price for one tube.
3. Using return on assets pricing, compute the unit price for one tube.

L03 Pricing a Service

E 6. Texas has just passed a law making it mandatory to have every head of cattle inspected at least once a year for a variety of communicable diseases. Big Springs Enterprises is considering entering this inspection business. After extensive studies, Tex Autry, the owner of Big Springs Enterprises, has developed the following annual projections:

Direct service labor	\$525,000
Variable service overhead costs	250,000
Fixed service overhead costs	225,000
Selling expenses	142,500
General and administrative expenses	157,500
Minimum desired profit	120,000
Cost of assets employed	750,000

Autry believes his company could inspect 250,000 head of cattle per year. On average, the company now earns a 16 percent return on assets.

1. Compute the projected cost of inspecting each head of cattle.
2. Determine the price to charge for inspecting each head of cattle. Use gross margin pricing.
3. Using return on assets pricing, compute the unit price to charge for this inspection service.

L03 Cost-based Pricing

E 7. Hometown Bank is determining the price for its newest mini debit card. The card can be used at any retail outlet with a swipe reader and is small enough to attach to a key chain—no PIN number or signature is required. Sigrid Olmo has developed the following annual information for use in upcoming price determination meetings:

Variable processing costs	\$50 million
Fixed processing costs	36 million
Selling expenses (fixed)	10 million
General and administrative expenses (fixed)	4 million
Desired profit	3 billion
Cost of assets employed	10 billion

Annual usage is expected to be 10 billion transactions. On average, the company now earns a 6 percent return on assets.

1. Compute the projected cost of one transaction.
2. Using gross margin pricing, compute the price to charge per transaction.
3. Using return on assets pricing, compute the price to charge per transaction.

L03 Pricing Services

E 8. Gator Car Repair specializes in repairing hybrid cars. The company uses a 70 percent markup rate on parts to cover parts-related overhead costs and profit margin. It uses a 100 percent markup rate on labor to cover labor-related overhead costs and profit margin. Compute the bill for a recent job that used the following parts and labor:

Material and repair parts used	\$550
Labor used	4 hours at \$40 per hour

L03 Time and Materials Pricing

E 9. Cruz's Home Remodeling Service specializes in refurbishing older homes. Last week Cruz was asked to bid on a remodeling job for the town's mayor. His list of materials and labor needed to complete the job is as follows:

Materials		Labor	
Lumber	\$ 6,500	Carpenter	\$2,000
Nails/bolts	160	Floor specialist	1,300
Paint	1,420	Painter	1,500
Glass	2,890	Supervisor	1,420
Doors	730	Helpers	<u>1,680</u>
Hardware	600	Total	<u>\$7,900</u>
Supplies	<u>400</u>		
Total	<u>\$12,700</u>		

The company uses an overhead markup percentage for materials (60 percent) and for labor (40 percent). Those markups cover all operating costs. In addition, Cruz expects to make at least a 25 percent profit on all jobs. Compute the price that Cruz should quote for the mayor's job.

LO4 Target Costing and Pricing

E 10. Environ Company has determined that its new fireplace screen would gain widespread customer acceptance if the company could price it at or under \$90. Anticipated labor hours and costs for each unit of the new product are as follows:

Direct materials cost	\$15
Direct labor cost	
Manufacturing labor	
Hours	1.2
Hourly labor rate	\$12
Assembly labor	
Hours	1.5
Hourly labor rate	\$10
Machine hours	2

The company currently uses the following three activity-based cost rates:

Materials handling	\$1.30 per dollar of direct materials
Production	\$3.00 per machine hour
Product delivery	\$5.50 per unit

The company's minimum desired profit is 25 percent over total production and delivery cost. Compute the target cost for the new fireplace screen, and determine if the company should market it.

LO4 Target Costing

E 11. Assume the same facts as in **E 10** except that the company's minimum desired profit has been revised to 10 percent over production and delivery costs as a result of a recent economic downturn. Compute the revised target cost for the new fireplace screen, and determine if the company should market it.

LO4 Target Costing

E 12. Suppose that **Ikea**, the Swedish retailer, is developing a new chair targeted to sell for less than \$100 and that it is considering the two production alternatives that follow. Rank the alternatives, assuming that the company's minimum desired profit is 30 percent over total production costs.

	Alternative A	Alternative B
Direct material costs	\$35	\$20
Direct labor cost	1 hour at \$12 per hour	2 hours at \$8 per hour
Overhead costs	200 percent of direct labor costs	\$2 per dollar of direct materials

L04 Target Costing

E 13. Management at Fox Valley Machine Tool Co. is considering the development of a new automated drill press called the AutoDrill. After conferring with the design engineers, the controller's staff assembled the following data about this product:

Target selling price	\$6,000 per unit
Desired profit percentage	20% of total unit cost
Projected unit demand	4,500 units
Activity-based cost rates	
Materials handling	5% of direct materials and purchased parts cost
Engineering	\$300 per unit for AutoDrill
Production and assembly	\$50 per machine hour
Delivery	\$570 per unit for AutoDrill
Marketing	\$400 per unit for AutoDrill
Per-unit data	
Direct materials cost	\$1,620
Purchased parts cost	\$200
Manufacturing labor	
Hours	6
Hourly labor rate	\$14
Assembly labor	
Hours	10
Hourly labor rate	\$15
Machine hours	30

1. Compute the product's target cost.
2. Compute the product's projected unit cost based on the design engineers' estimates.
3. Should management produce and market the AutoDrill? Defend your answer.

L05 Transfer Price Comparison

E 14. Mary Janus is developing a transfer price for the housing section of an automatic pool-cleaning device. The housing for the device is made in Department A. It is then passed on to Department D, where final assembly occurs. Unit costs for the housing are as follows:

Cost Categories	Unit Costs
Direct materials	\$5.20
Direct labor	2.30
Variable overhead	1.30
Fixed overhead	2.60
Profit markup, 20% of cost	?

An outside vendor can supply the housing for \$13.00 per unit.

1. Develop a cost-plus transfer price for the housing.
2. What should the transfer price be? Support your answer.

LO5 Transfer Pricing

E 15. Patch Watch Company's Seconds Store offers refurbished or factory seconds time-keeping products to the public at substantially reduced prices. The factory controller is developing transfer price alternatives to present to management to determine the best price to use when transferring products from the factory to the store, using the following data:

Unit price if sold to outside retailers	\$25
Variable product cost per unit	10
Fixed product cost per unit	5
Seconds store profit markup	40%

1. What is the market-based transfer price alternative?
2. What is the minimum transfer price alternative?
3. Compute the cost-plus transfer price alternative assuming cost includes variable costs only.

Problems

LO3 Pricing Decision

P 1. Ed Vetz & Company specializes in the assembly of home appliances. One division focuses most of its efforts on assembling a standard toaster oven. Projected costs of this product are as follows:

Cost Description	Budgeted Costs
Toaster casings	\$ 960,000
Electrical components	2,244,000
Direct labor	3,648,000
Variable indirect assembly costs	780,000
Fixed indirect assembly costs	1,740,000
Selling expenses	1,536,000
General operating expenses	840,000
Administrative expenses	816,000

The projected costs are based on an estimated demand of 600,000 toaster ovens per year. The company wants to make a \$1,260,000 profit.

Competitors have just published their wholesale prices for the coming year. They range from \$21.60 to \$22.64 per oven. The Vetz toaster oven is known for its high quality and modern look. It competes with products at the top end of the price range. Even with its reputation, however, every \$.20 increase above the top competitor's price causes a drop in demand of 60,000 units below the original estimate. Assume that all price changes are in \$.20 increments.

Required

1. Prepare a schedule of total projected costs and unit costs.
2. Use gross margin pricing to compute the anticipated selling price.
3. Based on competitors' prices, what should the Vetz toaster sell for (assume a constant unit cost)? Defend your answer. (**Hint:** Determine the total profit at various sales levels.)

- Manager insight ►** 4. Would your pricing structure in requirement 3 change if the company had only limited competition at its quality level? If so, in what direction? Explain why.

L03 Cost-Based Pricing

P2. Centered Publishing Company specializes in health awareness books. Because the field of health awareness is very competitive, Jay Rosenbek, the company's president, maintains a strict policy about selecting manuscripts to publish. Rosenbek wants to publish only books whose projected earnings are 20 percent above total projected costs. Three titles were accepted for publication during the year. The authors of those books are Tone, Tyme, and Klay. Projected costs for each book and allocation percentages for common costs are shown here.

Cost Categories	Tone Book	Tyme Book	Klay Book	Projected Costs
Direct labor	\$146,250	\$243,750	\$97,500	\$487,500
Royalty costs	\$36,000	\$60,000	\$24,000	120,000
Printing costs	\$74,580	\$124,300	\$49,720	248,600
Supplies	\$10,260	\$17,100	\$6,840	34,200
Variable production costs	\$42,600	\$71,000	\$28,400	142,000
Fixed production costs	35%	40%	25%	168,000
Distribution costs	30%	50%	20%	194,000
Marketing costs	\$61,670	\$90,060	\$42,270	194,000
General and administrative costs	35%	40%	25%	52,400

Expected sales for the year are as follows: Tone, 26,000 copies; Tyme, 32,000 copies; and Klay, 20,000 copies.

Required

1. Prepare a cost analysis that computes the desired profit for each of the three books and in total.
 2. Use gross margin pricing to compute the selling price for each book. (**Hint:** Treat royalty costs as production costs.)
 3. If the competition's average selling price for a book similar to Klay's is \$22, should this influence the pricing decision? Explain.
- Manager insight ►**

L03 Time and Materials Pricing in a Service Business

P3. Ace Maintenance, Inc., repairs heavy construction equipment and vehicles. Recently, the Shanti Construction Company had one of its giant earthmovers overhauled and its tires replaced. Repair work for a vehicle of that size usually takes from one week to ten days. The vehicle must be lifted up so that maintenance workers can gain access to the engine. Parts are normally so large that a crane must be used to put them into place.

The company uses the time and materials pricing system and data from the previous year to compute markup percentages for overhead related to parts and materials and overhead related to direct labor. It adds markups of 130 percent to the cost of materials and parts and 140 percent to the cost of direct labor to cover overhead and profit. The following materials, parts, and direct labor are needed to repair the giant earthmover:

Quantity	Unit Price	Hours	Hourly Rate
Materials and parts		Direct labor	
24 Spark plugs	\$ 3.40	42 Mechanic hours	\$18.20
20 Oil, quarts	2.90	54 Assistant mechanic hours	12.00
12 Hoses	11.60		
1 Water pump	764.00		
30 Coolant, quarts	6.50		
18 Clamps	5.90		
1 Distributor cap	128.40		
1 Carburetor	214.10		
4 Tires	820.00		

Required

Prepare a complete billing for this job. Include itemized amounts for each type of materials, parts, and direct labor. Follow the time and materials pricing approach, and show the total price for the job.

L04 Pricing Using Target Costing

P 4. Young Joon Corp. is considering marketing two new graphing calculators, named Speed-Calc 4 and Speed-Calc 5. According to recent market research, the two products will surpass the current competition in both speed and quality and would be welcomed in the market. Customers would be willing to pay \$98 for Speed-Calc 4 and \$110 for Speed-Calc 5, based on their projected design capabilities. Both products have many uses, but the primary market interest comes from college students. Current production capacity exists for the manufacture and assembly of the two products. The company has a minimum desired profit of 25 percent above all costs for all of its products. Current activity-based cost rates are as follows:

Materials/parts handling	\$1.20 per dollar of direct materials and purchased parts cost
Production	\$8.00 per machine hour
Marketing/delivery	\$4.40 per unit of Speed-Calc 4 \$6.20 per unit of Speed-Calc 5

Design engineering and accounting estimates to produce the two new products are as follows:

	Speed-Calc 4	Speed-Calc 5
Projected unit demand	100,000	80,000
Per-unit data		
Direct materials cost	\$5.50	\$7.50
Computer chip cost	\$10.60	\$11.70
Production labor		
Hours	1.2	1.3
Hourly labor rate	\$16.00	\$16.00
Assembly labor		
Hours	0.6	0.5
Hourly labor rate	\$12.00	\$12.00
Machine hours	1	1.2

Required

1. Compute the target costs for each product.
2. Compute the projected total unit cost of production and delivery.
3. Using the target costing approach, decide whether the products should be produced.

L05 Developing Transfer Prices

P 5. Cylinder Company has two divisions, Glass Division and Instrument Division. For several years, Glass Division has manufactured a special glass container, which it sells to Instrument Division at the prevailing market price of \$20. Glass Division produces the glass containers only for Instrument Division and does not sell the product to outside customers. Annual production and sales volume is 20,000 containers. A unit cost analysis for Glass Division showed the following:

Cost Categories	Costs per Container
Direct materials	\$ 3.50
Direct labor, 1¼ hours	2.30
Variable overhead	7.50
Avoidable fixed costs: $\$30,000 \div 20,000$	1.50
Corporate overhead: \$18 per direct labor hour	4.50
Variable shipping costs	<u>1.20</u>
Unit cost	<u>\$20.50</u>

Corporate overhead represents the allocated joint fixed costs of production—building depreciation, property taxes, insurance, and executives' salaries. A profit markup of 20 percent is used to determine transfer prices.

Required

1. What would be the appropriate transfer price for Glass Division to use in billing its transactions with Instrument Division?
2. If Glass Division decided to sell some containers to outside customers, would your answer to requirement 1 change? Defend your response.
3. What factors concerning transfer price should management consider when transferring products between divisions?

Manager insight ►

Alternate Problems**L03 Pricing Decision**

P 6. Sumac & Oak's, Ltd., designs and assembles low-priced portable Internet devices. It estimates that there will be 235,000 requests for its most popular model. Budgeted costs for this product for the year are as follows:

Description	Budgeted Costs
Casing	\$ 432,400
Battery chamber	545,200
Electronics	1,151,500
Direct labor	1,598,000
Variable indirect assembly costs	789,600
Fixed indirect assembly costs	338,400
Selling expenses	493,500
General operating expenses	183,300
Administrative expenses	126,900

The budget is based on the demand previously stated. The company wants to earn an annual operating income of \$846,000.

Last week, four competitors released their wholesale prices for the year. Their prices are as follows: Competitor A, \$25.68; Competitor B, \$24.58; Competitor C, \$23.96; Competitor D, \$25.30

Sumac & Oak's portable devices are known for their high quality. However, every \$1 price increase above the top competitor's price causes a 55,000-unit drop in demand from the original estimate. (Assume all price changes occur in \$1 increments.)

Required

1. Prepare a schedule of total projected costs and unit costs.
2. Use gross margin pricing to compute the anticipated selling price.
3. Based on competitors' prices, what should Sumac & Oak's portable device sell for (assume a constant unit cost)? Defend your answer. (**Hint:** Determine the total operating income at various sales levels.)
4. Would your pricing structure in requirement 3 change if the company had only limited competition at this quality level? If so, in what direction? Explain why.

Manager insight ►

LO3 Pricing Decisions

P7. The Fastener Company manufactures office equipment for retail stores. Carol Watson, the vice president of marketing, has proposed that Fastener introduce two new products: an electric stapler and an electric pencil sharpener. Watson has requested that the Profit Planning Department develop preliminary selling prices for the two new products for her review.

Profit Planning has followed the company's standard policy for developing potential selling prices. It has used all data available for each product. The data accumulated by Profit Planning are as follows:

	Electric Stapler	Electric Pencil Sharpener
Estimated annual demand in units	16,000	12,000
Estimated unit manufacturing costs	\$14.00	\$15.00
Estimated unit selling and administrative expenses	\$3.00	Not available
Assets employed in manufacturing	\$160,000	Not available

Fastener plans to use an average of \$1,200,000 in assets to support operations in the current year. The condensed budgeted income statement that follows reflects the planned return on assets of 20 percent ($\$240,000 \div \$1,200,000$) for the entire company for all products.

Fastener Company Budgeted Income Statement For the Year Ended May 31 (in thousands)	
Revenue	\$2,400
Cost of goods sold	<u>1,440</u>
Gross profit	\$ 960
Selling and administrative expenses	<u>720</u>
Operating income	<u>\$ 240</u>

Required

Manager insight ►

1. Calculate a potential selling price for (a) the stapler, using return on assets pricing, and (b) the pencil sharpener, using gross margin pricing.
2. Could a selling price for the electric pencil sharpener be calculated using return on assets pricing? Explain your answer.
3. Which of the two pricing methods—return on assets pricing or gross margin pricing—is more appropriate for decision analysis? Explain your answer.
4. Discuss the additional steps Carol Watson is likely to take in setting an actual selling price for each of the two products after she receives their potential selling prices (as calculated in requirement 1.) (CMA adapted)

L03 Time and Materials Pricing in a Service Business

P 8. Friendly Car Repair performs routine maintenance on rental vehicles. Recently, the local auto rental business had its fleet serviced. Friendly uses the time and materials pricing system and data from the previous year to compute markup percentages for overhead related to parts and materials and overhead related to direct labor. It adds markups of 100 percent to the cost of materials and parts and 120 percent to the cost of direct labor to cover overhead and profit. The following materials, parts, and direct labor are needed to repair the rental fleet:

Quantity	Unit Price	Hours	Hourly Rate
Materials and parts		Direct labor	
24 Spark plugs	\$ 0.50	38 Mechanic hours	\$28.20
50 Oil, quarts	2.50	61 Assistant mechanic hours	14.00
12 Hoses	11.20		
1 Sun visor	13.50		
36 Coolant, quarts	6.50		
4 Clamps	5.50		
5 Emergency kits	12.40		
40 Washer fluid	1.25		
4 Tires	300.00		

Required

Prepare a complete billing for this job. Include itemized amounts for each type of materials, parts, and direct labor. Follow the time and materials pricing approach, and show the total price for the job.

L04 Pricing Using Target Costing

P 9. Clevenger Machine Tool Company designs and produces a line of high-quality machine tools and markets them throughout the world. Its main competition comes from French, British, and Korean companies. Five competitors have recently introduced two highly specialized machine tools, Y14 and Z33. The prices charged for Y14 range from \$625 to \$675 per tool, and the price range for Z33 is from \$800 to \$840 per tool. Clevenger is contemplating entering the market for these two products. Market research has indicated that if Clevenger can sell Y14 for \$650 per tool and Z33 for \$750 per tool, it will be successful in marketing the products worldwide. The company's profit markup is 25 percent over all costs to produce and deliver a product. Current activity-based cost rates are as follows:

Materials handling	\$ 1.30 per dollar of direct materials and purchased parts cost
Production	\$ 4.40 per machine hour
Product delivery	\$34.00 per unit of Y14 \$40.00 per unit of Z33

Design engineering and accounting estimates for the production of the two new products are as follows:

	Product Y1 4	Product Z33
Projected unit demand	75,000	95,000
Per-unit data		
Direct materials cost	\$50.00	\$60.00
Purchased parts cost	\$65.00	\$70.00
Manufacturing labor		
Hours	6.2	7.4
Hourly labor rate	\$14.00	\$14.00
Assembly labor		
Hours	4.6	9.2
Hourly labor rate	\$12.00	\$12.00
Machine hours	14	16

Required

1. Compute the target cost for each product.
2. Compute the total projected unit cost of producing and delivering each product.
3. Using target costing, decide whether the products should be produced.

LO5 Developing Transfer Prices

P 10. Sims Corporation produces sound equipment for home use. Its Research and Development (R&D) Division is responsible for continually evaluating and updating critical electronic parts used in the corporation's products. Two years ago, R&D took on the added responsibility of producing all microchip circuit boards for the company's sound equipment. One of Sims's specialties is a sound dissemination board (SDB) that greatly enhances the quality of Sims's speakers.

Demand for the SDB has increased significantly in the past year. As a result, R&D has increased its production and assembly labor force. Three outside customers now want to purchase the SDB. To date, R&D has been producing SDBs for internal use only.

The R&D controller wants to create a transfer price for the SDBs that will apply to all intracompany transfers. Estimated demand over the next six months is 235,000 SDBs for internal use and 165,000 SDBs for external customers, for a total of 400,000 units. The following data show cost projections for the next six months:

Materials and parts	\$2,600,000
Direct labor	1,920,000
Supplies	100,000
Indirect labor	580,000
Other variable overhead costs	200,000
Fixed overhead, SDBs	1,840,000
Other fixed overhead, corporate	560,000
Variable selling expenses, SDBs	1,480,000
Fixed selling expenses, corporate	520,000
General corporate operating expenses	880,000
Corporate administrative expenses	680,000

A profit markup of at least 20 percent must be added to total unit cost for internal transfer purposes. Outside customers are willing to pay \$35 for each SDB. All categories of fixed costs are assumed to be unavoidable.

Required

- Manager insight ►
1. Prepare a table that shows the total budgeted costs and the cost per unit for each component of the budget. Also show the profit markup and the cost-plus transfer price.
 2. Should R&D use the computed transfer price? Explain the factors that influenced your decision.

ENHANCING Your Knowledge, Skills, and Critical Thinking

L01 L02 Ethics in Pricing

C 1. Barnes Company has been doing business in Hong Kong for the past three years. The company produces leather handbags that are in great demand there. When Barnes's sales person Harriet Mackay was recently in Hong Kong, Kwan Cho, the purchasing agent for Shen Enterprises, approached her to arrange for a purchase of 2,500 handbags. Barnes's usual price is \$75 per bag. Kwan Cho wanted to purchase the handbags at \$65 per bag. After an hour of haggling, they agreed to a final price of \$68 per item. When Makay returned to her hotel room after dinner, she found an envelope containing five new \$100 bills and a note that said, "Thank you for agreeing to our order of 2,500 handbags at \$68 per bag. My company's president wants you to have the enclosed gift for your fine service." Makay later learned that Kwan Cho was following her company's normal business practice. What should Harriet Makay do? Is the gift hers to keep? Be prepared to justify your opinion.

L03 L04 Product Pricing in a Foreign Market

C 2. Borner, Inc., is an international corporation that manufactures and sells home care products. Today a meeting is being held at corporate headquarters in New York City. The purpose of the meeting is to discuss changing the price of the laundry detergent the company manufactures and sells in Brazil. During the meeting, a conflict develops between Carl Dickson, the corporate sales manager, and José Cabral, the Brazilian Division's sales manager.

Dickson insists that the selling price of the laundry detergent should be increased to the equivalent of U.S. \$3. This increase is necessary because the Brazilian Division's costs are higher than those of other international divisions. The Brazilian Division is paying high interest rates on notes payable for the acquisition of a new manufacturing plant. In addition, a stronger, more expensive ingredient has been introduced into the laundry detergent, which has caused the product cost to increase by \$0.20.

Cabral believes that the laundry detergent's selling price should remain at \$2.50 for several reasons. He argues that the market for laundry detergent in Brazil is highly competitive. Labor costs are low, and the costs of distribution are small because the target market is limited to the Rio de Janeiro metropolitan area. Inflation is extremely high in Brazil, and the Brazilian government continues to impose policies to control inflation. Because of these controls, Cabral insists, buyers will resist any price hikes.

1. What selling price do you believe Borner, Inc., should set for the laundry detergent? Explain your answer. Do you believe Borner should let the Brazilian Division set the selling price for laundry detergent in the future? When should corporate headquarters set prices?
2. Based on the information given above, should cost-based pricing or target costing be used to set the selling price for laundry detergent in Brazil? Explain your answer.

L04 Target Costing and the Internet

C 3. Assume that you work for a company that wants to develop a product to compete with the Kindle. You have been assigned the task of using target costing to help in its development. Do a search for Kindle product reviews and product specifications and get price quotes. Why would your company's management want to use target costing to help in its development of a competitive e-book reader? What retail price would you suggest be used as a basis for target costing? Assuming a desired profit of 25 percent of selling price, what is the resulting target cost? What actions should the company take now?

L04 Target Costing

C 4. Every Electronics, Inc., produces circuit boards for electronic devices that are made by more than a dozen customers. Competition among the producers of circuit boards is keen, with over 30 companies bidding on every job request from those customers. The circuit boards can vary widely in their complexity, and their unit prices can range from \$250 to more than \$500.

Every's controller is concerned that the cost planning projection for a new complex circuit board, the CX35, is almost 6 percent above its target cost. The controller has asked the Engineering Design Department to review its design and projections and come up with alternatives that will reduce the proposed product's costs to equal to or below the target cost. The following information was used to develop the initial cost projections:

Target selling price	\$590.00 per unit
Desired profit percentage	25% of total unit cost
Projected unit demand	13,600 units
Per-unit data	
Direct materials cost	\$56.00
Purchased parts cost	\$37.00
Manufacturing labor	
Hours	4.5
Hourly labor rate	\$14.00
Assembly labor	
Hours	5.2
Hourly labor rate	\$15.00
Machine hours	26
Activity-based cost rates	
Materials handling	10% of direct materials and purchased parts cost
Engineering	\$13.50 per unit for CX35
Production	\$8.20 per machine hour
Product delivery	\$24.00 per unit for CX35
Marketing	\$6.00 per unit for CX35

1. Compute the product's target cost.
2. Compute the product cost of the original estimate to verify that the controller's calculations were correct.
3. Rework the product cost calculations for each of the following alternatives recommended by the design engineers:
 - a. Cut product quality, which will reduce direct materials cost by 20 percent and purchased parts cost by 15 percent.
 - b. Increase the quality of direct materials, which will increase direct materials cost by 20 percent but will reduce machine hours by 10 percent, manufacturing labor hours by 16 percent, and assembly labor hours by 20 percent.
4. What decision should the management of Every Electronics, Inc., make about the new product? Defend your answer.

L05 Transfer Pricing

C 5. Cirrus Industries, Inc., has two major operating divisions, the Cabinet Division and the Electronics Division. The company's main product is a deluxe console television set. The TV cabinets are manufactured by the Cabinet Division, and the Electronics Division produces all electronic components and assembles the sets. The company has a decentralized organizational structure.

The Cabinet Division not only supplies cabinets to the Electronics Division but also sells cabinets to other TV manufacturers. The following unit cost breakdown for a deluxe television cabinet was developed based on a typical sales order of 40 cabinets:

Direct materials	\$ 32.00
Direct labor	15.00
Variable overhead	12.00
Fixed overhead	18.00
Variable selling expenses	9.00
Fixed selling expenses	6.00
Fixed general and administrative expenses	<u>8.00</u>
Total unit cost	<u>\$100.00</u>

The Cabinet Division's usual profit margin is 20 percent, and the regular selling price of a deluxe cabinet is \$120. The division's managers recently decided that \$120 will also be the transfer price for all intracompany transactions.

Managers at the Electronics Division are unhappy with that decision. They claim that the Cabinet Division will show superior performance at the expense of the Electronics Division. Competition recently forced the company to lower its prices. Because of the newly established transfer price for the cabinet, the Electronics Division's portion of the profit margin on deluxe television sets was lowered to 18 percent. To counteract the new intracompany transfer price, the managers of the Electronics Division announced that effective immediately, all cabinets will be purchased from an outside supplier, in lots of 200 cabinets at a unit price of \$110 per cabinet. The company president, Joe Springer, has called a meeting of both divisions to negotiate a fair intracompany transfer price. The following prices were listed as possible alternatives:

Current market price	\$120 per cabinet
Current outside purchase price (This price is based on a large-quantity purchase discount. It will cause increased storage costs for the Electronics Division.)	\$110 per cabinet
Total unit manufacturing costs plus a 20 percent profit margin: \$77.00 + \$15.40	\$92.40 per cabinet
Total unit costs excluding variable selling expenses plus a 20 percent profit margin: \$91.00 + \$18.20	\$109.20 per cabinet

1. What price should be established for intracompany transactions? Defend your answer by showing the shortcomings of each alternative.
2. If there were an outside market for all units produced by the Cabinet Division at the \$120 price, would you change your answer to 1? Why?

LO5 Cookie Company (Continuing Case)

C6. Your company produces cookies in a two-step process. The Mixing Division prepares the cookie dough and transfers it to the Baking Division, which bakes the cookies and packs all finished cookies for shipment.

At a recent meeting of your company's board of directors, the manager of the Baking Division made this statement: "That Mixing Division is robbing us blind!" Because of the board's concern about this statement, the company controller gathered the following data for the past year:

	Mixing Division	Baking Division
Sales		
Regular	\$700,000	\$1,720,000
Deluxe	900,000	3,300,000
Direct materials		
Cookie dough (from Mixing Division)	—	1,600,000
Cookie ingredients	360,000	—
Box inserts	—	660,000
Boxes	—	1,560,000
Direct labor	480,000	540,000
Variable overhead	90,000	240,000
Fixed divisional overhead—avoidable	150,000	210,000
Selling and general operating expenses	132,000	372,000
Company administrative expenses	84,000	108,000

During the year, the two divisions completed and transferred or shipped 200,000 regular cookie boxes and 150,000 deluxe cookie boxes. Transfer prices used by the Mixing Division were as follows:

Regular	\$3.50
Deluxe	6.00

The regular box wholesales for \$8.60 and the deluxe box for \$22.00. The company uses a predetermined formula to allocate administrative costs to the divisions. Management has indicated that the transfer price should include a 20 percent profit factor on total division costs.

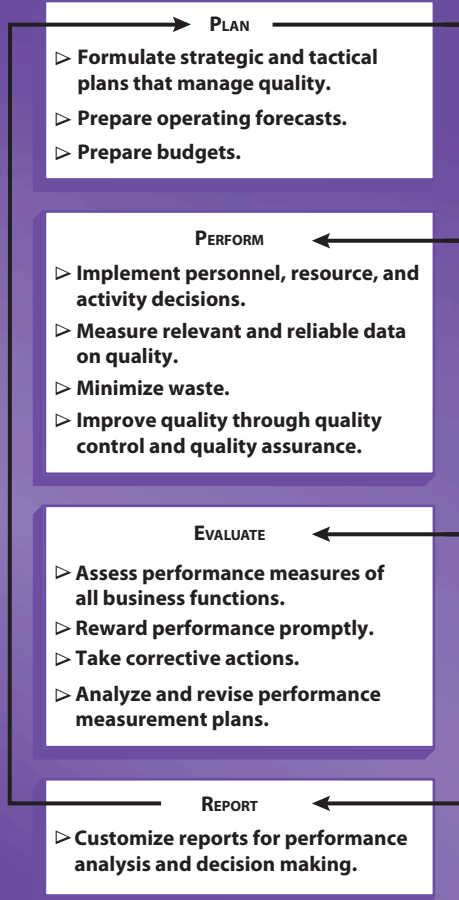
1. Prepare a performance report on the Mixing Division.
2. Prepare a performance report on the Baking Division.
3. Compute each division's rate of return on controllable costs and on total division costs.
4. Do you agree with the statement made by the manager of the Baking Division? Explain your response.
5. What procedures would you recommend to the board of directors?

CHAPTER

13

Quality Management and Measurement

The Management Process



Managers focus on quality to compete successfully in today's marketplace.

Quality has many dimensions. Not only must a product or service be defect-free and dependable; it must also embody such intangibles as prestige and good taste. Managers must meet or exceed a variety of expectations about customer service and create innovative new products and services that anticipate the opportunities offered by an ever-changing marketplace. To compete successfully, managers need information that enables them to determine accurate product, service, and customer costs; to improve processes; and to provide timely feedback about their organization to all stakeholders. Such information can be produced only by an information system that captures both financial and nonfinancial information. In this chapter, we describe financial and nonfinancial measures of quality and how managers use these measures to evaluate operating performance.

LEARNING OBJECTIVES

- L01** Describe a management information system, and explain how it enhances management decision making. (pp. 518–520)
- L02** Define *total quality management (TQM)*, and identify financial and nonfinancial measures of quality. (pp. 520–526)
- L03** Use measures of quality to evaluate operating performance. (pp. 526–530)
- L04** Discuss the evolving concept of quality. (pp. 530–532)
- L05** Recognize the awards and organizations that promote quality. (pp. 532–533)

DECISION POINT ► A MANAGER'S FOCUS AMAZON.COM

Through its innovative approach to selling books and other merchandise online, [Amazon.com](https://www.amazon.com) has changed the rules of successful electronic retailing. To maintain a competitive advantage, the company's managers must have an information system that produces more than just financial data. They need an extensive information infrastructure that can capture all kinds of information in huge, secure databases. Amazon.com's databases contain trillions of bytes of information that the company can privately mine and use in multiple applications.

Customers of online retailing firms have come to expect not only innovative features but also a high standard of product reliability and service. Amazon.com can continue to challenge and experiment with the ever-evolving ecommerce business model only if its management information system remains on the cutting edge of database technology and produces pertinent information of the highest quality for its managers.

- How do Amazon.com's managers maintain the company's competitive edge?
- What measures of quality can Amazon.com use to evaluate operating performance?



The Role of Management Information Systems in Quality Management

LO1 Describe a management information system, and explain how it enhances management decision making.

Many traditional management information systems contain only financial data and do not produce the sort of information that is necessary in today's competitive business environment. To compete successfully, managers need information that enables them to determine accurate product, service, and customer costs; improve processes; and provide timely feedback to all stakeholders about their organization. Such information can be produced only by an information system that captures both financial and nonfinancial information.

This kind of **management information system (MIS)** is a reporting system that identifies, monitors, and maintains continuous, detailed analyses of a company's activities and provides managers with timely measures of operating results. It is designed to support such management philosophies as lean operations, activity-based management (ABM), and total quality management (TQM).

The primary focus of an MIS is on the management of activities, not on costs. By focusing on activities, an MIS provides managers with improved knowledge of the processes for which they are responsible. Activity-related information that is needed to increase responsiveness to customers and reduce processing time is readily available. More accurate product and service costs lead to improved pricing decisions. Nonvalue-adding activities are highlighted, and managers can work to reduce or eliminate them. In addition to providing information about product profitability, an MIS can analyze the profitability of individual customers and look at all aspects of serving customers. Overall, the MIS identifies resource usage and cost for each activity and fosters managerial decisions that lead to continuous improvement throughout the organization.

Enterprise Resource Planning Systems

An MIS can be designed as a customized, informally linked series of systems for specific purposes, such as financial reporting, product costing, and business process measurement, or as a fully integrated database system known as an **enterprise resource planning (ERP) system**. An ERP system combines the management of all major business activities (e.g., purchasing, manufacturing, marketing, sales, logistics, and order fulfillment) with support activities (e.g., accounting and human resources) to form one easy-to-access, centralized data warehouse. An ERP system not only fosters communication within an organization; it can also communicate with other businesses' databases.

This chapter's Decision Point presents an example of an ERP system that has merged **Amazon.com's** operating, financial, and management systems into one extensive information infrastructure. Because of its ability to access a variety of data types from multiple sources, both inside and outside the company, Amazon.com has developed a competitive advantage in achieving financial targets and quality results. Using improved knowledge of the activities and processes for which they are responsible, Amazon.com's managers have pinpointed resource usage and fostered managerial decisions that have led to continuous improvement throughout the organization.

Study Note

The term *enterprise resource management (ERM)* can be used in place of *ERP*.

Managers' Use of MIS

Like the managers at Amazon.com, business managers today use their management information systems' detailed, real-time financial and nonfinancial information about customers, inventory, resources, and the supply chain to manage quality. Without the flexibility and power of database management information systems like ERP, managers would be at a disadvantage in today's rapidly changing and highly competitive business environment.



FOCUS ON BUSINESS PRACTICE

How Do Health Care Professionals Measure Success?

The National Quality Measures Clearinghouse is a repository of evidence-based measures sponsored by the Agency for Healthcare Research and Quality and the U.S. Department of Health and Human Services. This database can be used to assess treatment quality and to view the recovery odds for various medical conditions. It lists by disease, medical

condition, or treatment the quality measures that health care professionals use to evaluate medical success. For example, the bacterial pneumonia link discusses measures like hospital admission rates and response rates to various antibiotic regimens or vaccines. Visit the website at www.qualitymeasures.ahrq.gov.

Planning Managers use the MIS database to obtain relevant and reliable information for formulating strategic plans, making forecasts, and preparing budgets.

For example, managers at Amazon.com use their MIS to develop forecasts and budgets for existing operations and to create plans for new value-adding products and services.

Performing Managers use the financial and nonfinancial information in the MIS database to implement decisions about personnel, resources, and activities that will minimize waste and improve the quality of their organization's products or services.

At Amazon.com, managers use their supply-chain and value-chain software to manage operations in ways that ensure accurate order fulfillment and timely delivery.

Evaluating Managers identify and track financial and nonfinancial performance measures to evaluate all major business functions.

By enabling the timely comparison of actual performance with expected performance, Amazon.com's MIS allows managers to reward good performance promptly, take speedy corrective actions, and analyze and revise performance measurement plans.

Communicating Managers can use an MIS to generate customized reports that evaluate performance and provide useful information for decision making.

For example, managers at Amazon.com can consolidate customer profiles from their company's sophisticated database into a real-time report available on their desktops to continuously monitor the changing buying habits of their customers.

STOP

& APPLY >

Lamar Remy has been asked to develop a plan for installing a management information system in his company. The president has already approved the concept and has given Remy the go-ahead. What kind of information will Remy need to give managers to help them with their decision making?

(continued)

SOLUTION

To help managers plan, Remy will need to make sure that the company's MIS database provides relevant and reliable information that managers can use to formulate strategic plans, make forecasts, and prepare budgets. To help managers perform, Remy will need to focus on expanding the collection of financial and nonfinancial data to improve personnel, resource, and activity decision making; minimize waste; and improve the quality of the company's products and services. To help managers evaluate, Remy will need to improve the identification and tracking of the performance measures the company uses to evaluate all business functions. To help managers communicate, Remy will need to improve the system's ability to generate customized reports that evaluate performance and provide useful information for decision making.

Financial and Nonfinancial Measures of Quality

LO2 Define *total quality management (TQM)*, and identify financial and nonfinancial measures of quality.

Over the past two decades, organizations have defined quality in terms of what their customers value. Organizations believe that customers want the highest-quality goods and services and that customers' willingness to pay for high quality will result in improved organizational profits. As a result, organizations strive to exceed customers' expectations and improve the quality of their products or services. Quality is not something that a company can simply add at some point in the production process or assume will happen automatically. Inspections can detect bad products, but they do not ensure quality. Managers need reliable measures of quality to help them meet the goal of producing high-quality, reasonably priced products or services. They need to create a total quality management environment.

► **Total quality management (TQM)** is an organizational environment in which all business functions work together to build quality into the firm's products or services.

The first step toward creating a TQM environment is to identify and manage the financial measures of quality, or the costs of quality. The second step is to analyze operating performance using nonfinancial measures and to require that all business processes and products or services be improved continuously.

Financial Measures of Quality

To the average person, *quality* means that one product or service is better than another—perhaps because of its design, its durability, or some other attribute. In a business setting, however, **quality** is the result of an operating environment in which a product or service meets or conforms to a customer's specifications the first time it is produced or delivered.

The **costs of quality** are the costs that are specifically associated with the achievement or nonachievement of product or service quality. Total costs of quality include (1) the costs of good quality, incurred to ensure the successful development of a product or service, and (2) the costs of poor quality, incurred to transform a faulty product or service into one that is acceptable to the customer.

The costs of quality can make up a significant portion of a product's or service's total cost. Therefore, controlling the costs of quality strongly affects profitability. Today's managers should be able to identify the activities associated with improving quality and should be aware of the cost of resources used to achieve high quality.

The costs of quality have two components: the **costs of conformance**, which are the costs incurred to produce a quality product or service, and the **costs of nonconformance**, which are the costs incurred to correct defects in a

Study Note

Costs of conformance include the costs of building quality into products and services by doing it right the first time.

product or service. Costs of conformance are made up of prevention costs and appraisal costs.

- ▶ **Prevention costs** are the costs associated with the prevention of defects and failures in products and services.
- ▶ **Appraisal costs** are the costs of activities that measure, evaluate, or audit products, processes, or services to ensure their conformance to quality standards and performance requirements.

The costs of nonconformance include internal failure costs and external failure costs.

- ▶ **Internal failure costs** are the costs incurred when defects are discovered before a product or service is delivered to a customer.
- ▶ **External failure costs** are costs incurred after the delivery of a defective product or service.

Table 13-1 gives examples of each cost category. Note that there is an inverse relationship between the costs of conformance and the costs of nonconformance. For example, if a company spends money on the costs of conformance, the costs of nonconformance should be reduced. However, if little attention is paid to the costs of conformance, the costs of nonconformance may escalate.

An organization's overall goal is to avoid costs of nonconformance because both internal and external failures affect customers' satisfaction and the organization's profitability. High initial costs of conformance are justified when they minimize the total costs of quality over the life of a product or service. Common quality ratios include: total cost of quality as a percentage of sales, the ratio of costs of conformance to total costs of quality, the ratio of costs of nonconformance to total costs of quality, and the costs of nonconformance as a percentage of sales.

Nonfinancial Measures of Quality

By measuring the costs of quality, a company learns how much it has spent in its efforts to improve product or service quality. But critics say that tracking historical data to monitor quality performance does little to enhance quality. What managers need is a measurement and evaluation system that signals poor quality early enough to allow problems to be corrected before a defective product or service reaches the customer. Implementing a policy of continuous improvement satisfies this need for early detection of poor quality and is the second stage of total quality management.

Nonfinancial measures of performance, identified and reported to managers in a timely manner, are used to supplement cost-based measures. Although cost control is still an important consideration, a commitment to ongoing improvement encourages activities that enhance quality at every stage, from design to delivery. As explained earlier, those activities, or cost drivers, cause costs. By controlling the leading nonfinancial performance measures of activities, managers can ultimately maximize the resulting financial return from operations. Five categories of nonfinancial measures of quality are discussed in the following sections:

- ▶ Product design
- ▶ Vendor performance
- ▶ Production performance
- ▶ Delivery cycle time
- ▶ Customer satisfaction

Study Note

Internal failure costs are costs incurred to correct mistakes found by the company. External failure costs are costs incurred to correct mistakes discovered by customers.

Study Note

Nonfinancial measures gauge quality and the value created throughout the supply and value chains.

TABLE 13-1
Financial Measures of Quality

Costs of Conformance to Customer Standards	
Prevention Costs	
Technical support for vendors	Quality-certified suppliers
Integrated system development	Quality circles
Quality improvement projects	Preventive maintenance
Quality training of employees	Statistical process control
Design review of products and processes	Process engineering
Appraisal Costs	
Inspection of materials, processes, and machines	Maintenance of test equipment
End-of-process sampling and testing	Quality audits of products and processes
Vendor audits and sample testing	Field testing
Costs of Nonconformance to Customer Standards	
Internal Failure Costs	
Scrap and rework	Failure analysis
Reinspection and retesting of rework	Inventory control and scheduling
Quality-related downtime	Downgrading because of defects
Scrap disposal losses	
External Failure Costs	
Lost sales	Returned goods and replacements
Restoration of reputation	Investigation of defects
Warranty claims and adjustments	Product recalls
Customer complaint processing	Product-liability settlements
Measures of Quality	
Total costs of quality as a percentage of net sales	
Ratio of costs of conformance to total costs of quality	
Ratio of costs of nonconformance to total costs of quality	
Costs of nonconformance as a percentage of net sales	

Product Design Problems with quality often are the result of poor design. Most automated production operations use **computer-aided design (CAD)**, a computer-based engineering system with a built-in program to detect product design flaws. Such computer programs automatically identify poorly designed parts or manufacturing processes, which means that engineers can correct these problems before production begins. Managers monitor the CAD reports on design flaws to ensure that products are properly designed and free of defects. Among the measures that they consider are the number and types of design defects detected, the average time between defect detection and correction, and the number of unresolved design defects at the time of product introduction.

Vendor Performance Companies have changed the way they do business with suppliers of materials. Instead of dealing with dozens of suppliers in a quest for the lowest cost, companies now analyze their vendors to determine which ones are most reliable, furnish high-quality goods, have a record of timely deliveries, and charge competitive prices. Once a company has identified such vendors, they become an integral part of the production team’s effort to ensure a continuing supply of high-quality materials. Vendors may even contribute to product design to ensure that the correct materials are being used.

Managers use measures of quality (such as defect-free materials as a percentage of total materials received) and measures of delivery (such as timely deliveries as a percentage of total deliveries) to identify reliable vendors and monitor their performance.

Production Performance Management must always be concerned about the wasted time and money that can be traced to defective products, scrapped parts, machine maintenance, and downtime. To minimize such concerns, more and more companies have adopted **computer-integrated manufacturing (CIM) systems**, in which production and its support operations are coordinated by computers. Within a CIM system, computer-aided manufacturing (CAM) may be used to coordinate and control production activities, or a flexible manufacturing system (FMS) may be used to link together automated equipment into a computerized flexible production network.

In CIM systems, most direct labor hours are replaced by machine hours, and very little direct labor cost is incurred. In addition, a significant part of variable product cost is replaced by the cost of expensive machinery, a fixed cost. Today, the largest item on a company's balance sheet is often automated machinery and equipment. Each piece of equipment has a specific capacity, above which continuous operation is threatened. When managers evaluate such machines, their measures have two objectives:

1. To evaluate the performance of each piece of equipment in relation to its capacity
2. To evaluate the performance of maintenance personnel in following a prescribed maintenance program

Measures of production quality, parts scrapped, equipment utilization, machine downtime, and machine maintenance time help managers monitor production performance.

Delivery Cycle Time Companies today are extremely interested in the amount of time they take to respond to customers. To evaluate their responsiveness to customers, companies examine their **delivery cycle time**, which is the time between the acceptance of an order and the final delivery of the product or service. When a customer places an order, it is important for a sales person to be able to promise an accurate delivery date. Companies pay careful attention to delivery cycle time not only because on-time delivery is important to customers but also because a decrease in delivery cycle time can lead to a significant increase in income from operations.

The formula to compute delivery cycle time is:

$$\text{Delivery Cycle Time} = \text{Purchase-Order Lead Time} + \text{Production Cycle Time} + \text{Delivery Time}$$

Delivery cycle time consists of

- ▶ **Purchase-order lead time** (the time it takes a company to take and process an order and organize so that production can begin),
- ▶ **Production cycle time** (the time it takes to make a product), and
- ▶ **Delivery time** (the time between the completion of a product and its receipt by the customer).

Managers should establish measures that emphasize the importance of minimizing the purchase-order lead time, production cycle time, and delivery time for each order. They should also track the average purchase-order lead time, production cycle time, and delivery time for all orders. Trends should be highlighted, and reports should be readily available. Other measures designed to monitor delivery

TABLE 13-2
Nonfinancial Measures of Quality

Measures of Product Design Quality

Product design flaws	Number and types of design defects detected
	Average time between defect detection and correction
	Number of unresolved design defects at time of product introduction

Measures of Vendor Performance

Vendor quality	Defect-free materials as a percentage of total materials received; prepared for each vendor
Vendor delivery	Timely deliveries of materials as a percentage of total deliveries; prepared for each vendor

Measures of Production Performance

Production quality	Number of defective products per thousand produced
Parts scrapped	Number and type of materials spoiled during production
Equipment utilization rate	Productive machine time as a percentage of total time available for production
Machine downtime	Amount of time each machine is idle
Machine maintenance time	Amount of time each machine is idle for maintenance and upgrades

Measures of Delivery Cycle Time

On-time deliveries	Shipments received by promised date as a percentage of total shipments
Orders filled	Orders filled as a percentage of total orders received
Average process time	Average time required to make a product available for shipment
Average setup time	Average amount of time elapsed between the acceptance of an order and the beginning of production
Purchase-order lead time	Time it takes a company to process an order and organize so that production can begin
Production cycle time	Time it takes to make a product
Delivery time	Time between a product's completion and its receipt by customer
Delivery cycle time	Time between the acceptance of an order and the final delivery of the product or service (purchase-order lead time + production cycle time + delivery time)
Waste time	Production cycle time – (average process time + average setup time)
Production backlog	Number and type of units waiting to begin processing

Measures of Customer Satisfaction

Customer complaints	Number and types of customer complaints
Warranty claims	Number and causes of claims
Returned orders	Shipments returned as a percentage of total shipments

cycle time include order backlogs, on-time delivery performance, percentage of orders filled, and waste time. The formula to compute waste time is:

$$\text{Waste Time} = \text{Production Cycle Time} - (\text{Average Process Time} + \text{Average Setup Time})$$

Customer Satisfaction The sale and shipment of a product does not mark the end of performance measurement. Customer follow-up helps in evaluating total customer satisfaction. Measures used to determine the degree of customer satisfaction include (1) the number and types of customer complaints, (2) the number and causes of warranty claims, and (3) the percentage of shipments returned by customers (or the percentage of shipments accepted by customers). Several companies have developed their own customer satisfaction indexes from these measures so that they can compare different product lines over different time periods.

Recap Table 13-2 lists specific examples of the many nonfinancial measures used to monitor quality. These measures help a company continuously produce higher-quality products, improve production processes, and reduce throughput time and costs.

Measuring Service Quality

The quality of services rendered can be measured and analyzed. Many of the costs of conformance and nonconformance for a product apply to the development and delivery of a service. Flaws in service design lead to poor-quality services. Timely service delivery is as important as timely product shipments. Customer satisfaction in a service business can be measured by services accepted or rejected, the number of complaints, and the number of returning customers. Poor service development leads to internal and external failure costs.

Many of the costs-of-quality categories and several of the nonfinancial measures of quality can be applied directly to services and can be adopted by any type of service company.

STOP & APPLY >

Internal reports on quality at the EMCAP Publishing Company generated the following information for the Trade Division for the first three months of the year:

Total sales	<u>\$60,000,000</u>
Costs of quality:	
Prevention	\$ 523,000
Appraisal	477,000
Internal failure	1,360,000
External failure	640,000

Compute the following:

- Total costs of quality as a percentage of sales
- Ratio of costs of conformance to total costs of quality
- Ratio of costs of nonconformance to total costs of quality
- Costs of nonconformance as a percentage of total sales

(continued)

SOLUTION

Costs of Conformance	= Prevention Costs + Appraisal Costs = \$523,000 + \$477,000 = <u>\$1,000,000</u>
Costs of Nonconformance	= Internal Failure Costs + External Failure Costs = \$1,360,000 + \$640,000 = <u>\$2,000,000</u>
a. Total Costs of Quality as a Percentage of Sales	= \$3,000,000 ÷ \$60,000,000 = <u>5%</u>
b. Ratio of Costs of Conformance to Total Costs of Quality	= Costs of Conformance ÷ (Costs of Conformance + Costs of Nonconformance) = \$1,000,000 ÷ (\$1,000,000 + \$2,000,000) = <u>0.33 to 1</u>
c. Ratio of Costs of Nonconformance to Total Costs of Quality	= Costs of Nonconformance ÷ (Costs of Conformance + Costs of Nonconformance) = \$2,000,000 ÷ (\$1,000,000 + \$2,000,000) = <u>0.67 to 1</u>
d. Costs of Nonconformance as a Percentage of Total Sales	= \$2,000,000 ÷ \$60,000,000 = <u>3.33%</u>

Measuring Quality: An Illustration

LO3 Use measures of quality to evaluate operating performance.

Using many of the examples of the costs of quality identified in Table 13-1 and the nonfinancial measures of quality listed in Table 13-2, the following sections demonstrate how a company measures and evaluates its progress toward the goal of achieving total quality management

Evaluating the Costs of Quality

As demonstrated in Exhibit 13-1, three companies—Able, Baker, and Cane—have taken different approaches to achieving product quality. All three companies are the same size, each having generated \$15 million in sales last year.

Key Quality Performance Questions We can evaluate each company's approach to quality enhancement by analyzing the costs of quality and by answering the following questions:

- ▶ Which company is most likely to succeed in the competitive marketplace?
- ▶ Which company has serious problems with its products' quality?
- ▶ What do you think will happen to the total costs of quality for each company over the next five years? Why?

Exhibit 13-2 shows that each company spent between 10.22 and 10.48 percent of its sales dollars on these costs. The following discussion is based on that analysis:

- ▶ *Which company is most likely to succeed in the competitive marketplace?* Able Co. spent the most money on costs of quality. What is more important, however, is that the company spent 80 percent of that money on costs of conformance, which will reap benefits in years to come. The company's focus on the costs of conformance means that only a small amount had to be spent on internal and external failure costs. The resulting high-quality products will lead to high customer satisfaction.

EXHIBIT 13-1

Analysis of the Costs of Quality

	Able Co.	Baker Co.	Cane Co.
Annual Sales	<u>\$15,000,000</u>	<u>\$15,000,000</u>	<u>\$15,000,000</u>
Costs of conformance to customer standards			
Prevention Costs			
Quality training of employees	\$ 210,000	\$ 73,500	\$ 136,500
Process engineering	262,500	115,500	189,000
Design review of products	105,000	42,000	84,000
Preventive maintenance	<u>157,500</u>	<u>84,000</u>	<u>115,500</u>
Subtotal	<u>\$ 735,000</u>	<u>\$ 315,000</u>	<u>\$ 525,000</u>
Appraisal Costs			
End-of-process sampling and testing	\$ 126,000	\$ 63,000	\$ 73,500
Inspection of materials	199,500	31,500	115,500
Quality audits of products	84,000	21,000	42,000
Vendor audits and sample testing	<u>112,500</u>	<u>52,500</u>	<u>63,000</u>
Subtotal	<u>\$ 522,000</u>	<u>\$ 168,000</u>	<u>\$ 294,000</u>
Total costs of conformance	<u>\$ 1,257,000</u>	<u>\$ 483,000</u>	<u>\$ 819,000</u>
Costs of nonconformance to customer standards			
Internal Failure Costs			
Scrap and rework	\$ 21,000	\$ 189,000	\$ 126,000
Reinspection of rework	15,750	126,000	73,500
Quality-related downtime	42,000	231,000	178,500
Scrap disposal losses	<u>26,250</u>	<u>84,000</u>	<u>52,500</u>
Subtotal	<u>\$ 105,000</u>	<u>\$ 630,000</u>	<u>\$ 430,500</u>
External Failure Costs			
Warranty claims	\$ 47,250	\$ 94,500	\$ 84,000
Returned goods and replacements	15,750	68,250	36,750
Investigation of defects	26,250	78,750	57,750
Customer complaint processing	<u>120,750</u>	<u>178,500</u>	<u>126,000</u>
Subtotal	<u>\$ 210,000</u>	<u>\$ 420,000</u>	<u>\$ 304,500</u>
Total costs of nonconformance	<u>\$ 315,000</u>	<u>\$ 1,050,000</u>	<u>\$ 735,000</u>
Total costs of quality	<u>\$ 1,572,000</u>	<u>\$ 1,533,000</u>	<u>\$ 1,554,000</u>
Total costs of quality as a percentage of sales	10.48%	10.22%	10.36%
Ratio of costs of conformance to total costs of quality	0.80 to 1	0.32 to 1	0.53 to 1
Ratio of costs of nonconformance to total costs of quality	0.20 to 1	0.68 to 1	0.47 to 1
Costs of nonconformance as a percentage of sales	2.10%	7.00%	4.90%

- *Which company has serious problems with its products' quality?* Baker Co. spent the least on costs of quality but that's not the reason it is in serious trouble. Over 68 percent of its costs of quality (\$1,050,000 of a total of \$1,533,000) was spent on internal and external failure costs. Scrap costs, reinspection costs, the cost of downtime, warranty costs, and customer complaint costs were all high. Baker's products are very low in quality, which will lead to hard times in the future.

EXHIBIT 13-2

Analysis of Nonfinancial Measures of Quality

	Able Co.	Baker Co.	Cane Co.
Vendor Performance			
Percentage of defect-free materials			
2011	98.20%	94.40%	95.20%
2012	98.40%	93.20%	95.30%
2013	98.60%	93.10%	95.20%
Production Performance			
Production quality level (product defects per million)			
2011	1,400	4,120	2,710
2012	1,340	4,236	2,720
2013	1,210	4,340	2,680
Delivery Cycle Time			
Percentage of on-time deliveries			
2011	94.20%	76.20%	84.10%
2012	94.60%	75.40%	84.00%
2013	95.40%	73.10%	83.90%
Customer Satisfaction			
Percentage of returned orders			
2011	1.30%	6.90%	4.20%
2012	1.10%	7.20%	4.10%
2013	0.80%	7.60%	4.00%
Number of customer complaints			
2011	22	189	52
2012	18	194	50
2013	12	206	46

- *What do you think will happen to the total costs of quality for each company over the next five years? Why?*

Able Co. When money is spent on costs of conformance early in a product's life cycle, quality is integrated into the development and production processes. Once a high level of quality has been established, total costs of quality should be lower in future years. Able Co. seems to be in that position today.

Baker Co. Baker's costs of conformance will have to increase significantly if the company expects to stay in business. It is spending 7 percent of its sales revenue on internal and external failure costs. Because the marketplace is not accepting its products, its competitors have the upper hand and the company is in a weak position.

Cane Co. Cane Co. is taking a middle road. This company is spending a little more than half (53 percent) of its cost-of-quality dollars on conformance, so product quality should be increasing. However, the company is still incurring high internal and external failure costs. Cane's managers must learn to prevent such costs if they expect the company to remain competitive.

Evaluating Nonfinancial Measures of Quality

From the information presented in Exhibit 13-2, we can evaluate each company's experience in its pursuit of total quality management. That part of the exhibit presents nonfinancial measures for each company for three years—2011, 2012, and 2013. The trends shown there tend to support the findings in the analysis of the costs of quality in Exhibit 13-1.

Able Co. For Able Co., 98.2 percent of the materials received from suppliers in 2011 were of high quality, and the quality has been increasing over the three years. The product defect rate, measured in number of defects per million, has been decreasing rapidly, proof that the costs of conformance are having a positive effect. The percentage of on-time deliveries has been increasing, and both the percentage of returned orders and the number of customer complaints have been decreasing, which means that customer acceptance and satisfaction have been increasing.

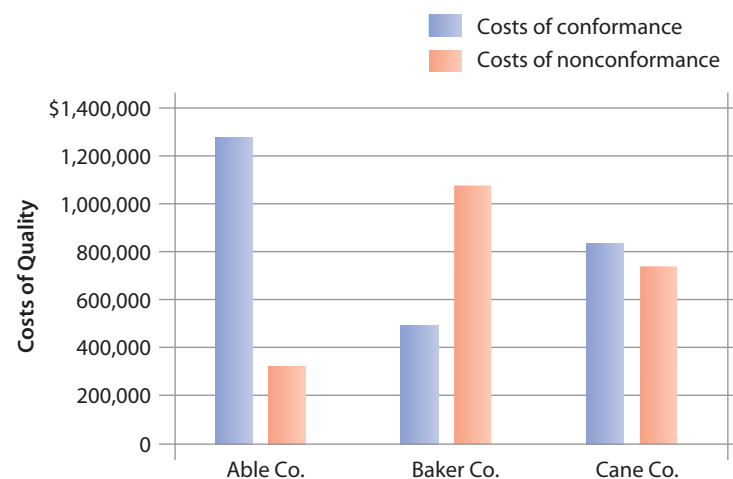
Baker Co. Baker Co.'s experience is not encouraging. The number of high-quality shipments of materials from vendors has been decreasing, the product defect rate has been increasing (it seems to be out of control), on-time deliveries were bad to begin with and have been getting worse, more goods have been returned each year, and customer complaints have been on the rise. All those signs reflect the company's high costs of nonconformance.

Cane Co. Cane Co. is making progress toward higher quality, but its progress is very slow. Most of the nonfinancial measures show a very slight positive trend. More money needs to be spent on the costs of conformance.

A graphic analysis can be very useful when a manager is comparing the performance of several operating units. Mere columns of numbers do not always adequately depict differences in operating performance and may be difficult to interpret. In such cases, a chart or graph can help managers see what the data are saying. For example, the bar graph in Figure 13-1 illustrates the amounts that Able, Baker, and Cane are spending on costs of quality. It clearly shows that

- ▶ Able Co. is focusing on costs of conformance and has low costs of nonconformance.
- ▶ Baker Co., in contrast, is paying over \$1,000,000 in costs of non-conformance because it has not tried to increase spending on prevention and appraisal.
- ▶ Cane Co. spends slightly more on costs of conformance than on costs of nonconformance, but, like Baker Co., it is spending too much on failure costs.

FIGURE 13-1
Comparison of Costs of Quality:
Conformance Versus Nonconformance



STOP & APPLY >

A corporation has two departments, Department C and Department D, that produce two separate product lines. The company has been implementing total quality management over the past year. Conformance and nonconformance cost ratios of quality for the year for each department are presented below. Which department is committed to TQM?

	Dept. C	Dept. D	Totals
Total costs of quality as a percentage of sales	5.00%	5.00%	5.00%
Ratio of costs of conformance to total costs of quality	0.70 to 1	0.35 to 1	0.51 to 1
Ratio of costs of nonconformance to total costs of quality	0.30 to 1	0.65 to 1	0.49 to 1
Costs of nonconformance as a percentage of sales	1.50%	3.25%	2.45%

SOLUTION

Department C is taking a more serious approach to implementing TQM. It is spending more than twice as much on costs of conformance as on costs of nonconformance. Department D is doing almost the opposite.

The Evolving Concept of Quality

LO4 Discuss the evolving concept of quality.

Much of what organizations now know about quality can be traced to past manufacturing initiatives. Before the advent of TQM over 20 years ago, managers assumed that there was a trade-off between the costs and the benefits of improving quality. In economic terms, a **return on quality (ROQ)** results when the marginal revenues possible from a higher-quality good or service exceed the marginal costs of providing that higher quality. In other words, managers must weigh the high costs of consistent quality against the resulting higher revenues, and they must base the quality standards for a good or service on the expected return on quality.

In the 1980s, quality gave organizations a competitive edge in the global marketplace. W. Edwards Deming and other advocates of TQM stressed improved quality as a means of enhancing an organization's efficiency and profits. As a result, managers focused on increasing customer satisfaction and product or service quality, and organizations recognized the value of producing highly reliable products. Companies emphasized **kaizen**, or the gradual and ongoing improvement of products and processes while reducing costs. Quality control methods such as statistical analysis, computer-aided design, and Six Sigma eliminated defects in the design and manufacture of products. Today more than 90 percent of the *Fortune* 500 companies use a combination of those methods.

The story of **Motorola** and its Six Sigma quality standard illustrates how product quality quickly improved. In 1978, Motorola was losing market share as a result of aggressive competition from high-quality Japanese goods. In response, Motorola set the goal of Six Sigma quality, which meant that Motorola's customers would perceive the company's products and services as perfect. It used the DMAIC (define, measure, analyze, improve, control) and DMADV (define, measure, analyze, design, verify) methods to improve both existing processes and new ones. Motorola applied the Six Sigma quality standard to all aspects of its operations—not just to production. Even Motorola's Corporate Finance Department measures defects per unit, tracking its number of errors per monthly close and the time it takes to close the books each month.

Thousands of companies, including **Amazon.com**, have embraced the data-driven approach of Six Sigma to reduce errors. But Six Sigma has its drawbacks,

The Walt Disney character Minnie Mouse interacts with customers waiting in line at Disney's Magic Kingdom in Orlando, Florida. Disney theme parks use characters to keep waiting customers amused, thereby maximizing customers' satisfaction with the theme park experience. Courtesy of Joe Raedle/Getty Images.



including diminishing worker morale and invention, and many companies are rethinking Six Sigma as a business cure-all.

Two respected techniques made popular by Six Sigma, benchmarking and process mapping, are still widely used and allow managers to understand and measure quality improvements.

- ▶ **Benchmarking** is the measurement of the gap between the quality of a company's process and the quality of a parallel process at the best-in-class company. For example, Motorola improved its order-processing system by studying order processing at **Lands' End**.
- ▶ **Process mapping** is a method of using a flow diagram to indicate process inputs, outputs, constraints, and flows to help managers identify unnecessary efforts and inefficiencies in a business process. Quality problems and their causes are visually tracked using control charts, histograms, cause-and-effect diagrams, and Pareto diagrams. As a result, customer satisfaction with a product or service and with the buying experience both before and after the sale is enhanced.

Service businesses also recognize the importance of quality and seek to maximize customers' satisfaction with their services. For example, **Disney** theme parks minimize customers' impatience as they wait in long lines by having Disney characters interact and play with the crowd. A potential customer problem becomes another opportunity to deliver Disney magic.

In summary, a manager's concept of quality must continuously evolve to fulfill customers' needs and expectations and to meet the demands of the changing business environment. Quality has many dimensions. Not only must a product or service be defect-free and dependable; it must also embody such intangibles as prestige and good taste. Managers must meet or exceed a variety of expectations about customer service and create innovative new products and services that anticipate the opportunities offered by an ever-changing marketplace. The concept of quality means more than having zero defects in a product or service; it means doing everything possible to have zero defections of customers.

STOP & APPLY >

Ecommerce has changed the way goods and services are obtained. How do companies like **Amazon.com** continue to anticipate customer needs? To answer this question, visit Amazon.com's website.

SOLUTION

Ecommerce companies use their huge databases to spot customer trends and maintain their competitive advantage. Such innovations as customer-specific web pages, prepublication book sales, and rapid delivery have benefits for both the company and its customers.

Recognition of Quality

LO5 Recognize the awards and organizations that promote quality.

Many awards and organizations have been established to recognize and promote the importance of quality. Three of the most prestigious awards are the Deming prizes, the EFQM Excellence Award, and the Malcolm Baldrige Quality Award. In addition, the International Organization for Standardization works to promote quality standards worldwide.

Deming Prizes In 1951, the Japanese Union of Scientists and Engineers established the Deming Application Prize to honor individuals or groups who have contributed to the development and dissemination of total quality control. Consideration for the prize was originally limited to Japanese companies, but interest in it was so great that the rules were revised to allow the participation of companies outside Japan. Today, the organization awards several **Deming prizes** to companies and individuals who achieve distinctive results by carrying out total quality control.

EFQM Excellence Award Since the 1990s the nonprofit European Foundation for Quality Management has presented the **EFQM Excellence Award** annually to businesses and organizations operating in Europe that excel in quality management. The EFQM has also developed a quality framework called the EFQM Excellence Model to help businesses

- ▶ Define their vision and measurable goals.
- ▶ Understand business systems and their causal relationships and links.
- ▶ Identify and promote successful internal and external customer experiences.
- ▶ Self-assess their current organizational health.

Malcolm Baldrige National Quality Award In 1987, the U.S. Congress created the **Malcolm Baldrige National Quality Award** to recognize U.S. organizations for their achievements in quality and business performance and to raise awareness of the importance of quality and performance excellence. Organizations are evaluated on the basis of the Baldrige performance excellence criteria, standards that are divided into seven categories:

- ▶ Leadership
- ▶ Strategic planning
- ▶ Customer and market focus
- ▶ Measurement, analysis, and knowledge management
- ▶ Work force focus

- ▶ Process management
- ▶ Results

Thousands of organizations throughout the world accept the Baldrige criteria as the standards for performance excellence and use them for training and self-assessment, whether they plan to compete for the award or not. Award winners are showcased annually on the Internet (www.quality.nist.gov) and are encouraged to share their best practices with others.

ISO Standards The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies (<http://www.iso.org>). It promotes standardization with a view to facilitating the international exchange of goods and services. For example, by developing a standard format for credit cards, standard film speed codes, and standard graphical symbols for use on equipment and diagrams, the ISO has saved time and money for both individuals and businesses worldwide.

To standardize quality management and quality assurance, the ISO has developed families of standards that have been implemented by more than a million organizations in 175 countries. The two most popular standards families are ISO 9000 and ISO 14000. The **ISO 14000** series provides an environmental management framework to minimize the harmful environmental effects of business activities and continually improve environmental performance.

ISO 9000 is a set of guidelines for businesses that covers the design, development, production, final inspection and testing, installation, and servicing of products, processes, and services. Because many organizations do business only with ISO-certified companies, these guidelines have been adopted worldwide. To become ISO certified, an organization must pass a rigorous third-party audit of its manufacturing and service processes. As a result, certified companies have detailed documentation of their operations. There are eight quality management principles of ISO 9000:

- ▶ Customer focus
- ▶ Leadership
- ▶ Involvement of people
- ▶ Process approach
- ▶ System approach to management
- ▶ Continual involvement
- ▶ Factual approach to decision making
- ▶ Mutually beneficial supplier relationships

Study Note

Some ISO standards vary between countries. For example, the standard size of computer paper in the United States is different from the standard size in European countries.

STOP & APPLY >

Some quality standards or principles appear to be comparable among the organizations that promote quality. List some of the shared principles.

SOLUTION

Quality principles shared by the Baldrige award and ISO include customer focus or customer and market focus; leadership; involvement of people or work force focus; process approach or process management; and factual approach to decision making or measurement, analysis, and knowledge management. There is some overlap in the other areas as well.

Required

1. Analyze the nonfinancial measures of quality of the division for the eight-week period. Focus on the following areas of performance:
 - a. Production performance
 - b. Delivery cycle time
 - c. Customer satisfaction
2. Summarize your findings in a report to the division's superintendent.

Answers to Review Problem

1. Analysis of nonfinancial measures of performance. The data given were reorganized as shown below, and one additional piece of information, average waste time, was calculated from the data.

	A	B	C	D	E	F	G	H	I	J	K
			Week								Weekly
			1	2	3	4	5	6	7	8	Average
3	a.	Production Performance									
4		Machine downtime (hours)	86.5	83.1	76.5	80.1	90.4	100.6	120.2	124.9	95.3
5		Equipment utilization rate (%)	98.2	98.6	98.9	98.5	98.1	97.3	96.6	95.7	97.7
6		Machine maintenance time (hours)	34.6	32.2	28.5	22.1	18.5	12.6	19.7	26.4	24.3
7	b.	Delivery Cycle Time									
8		On-time deliveries (%)	93.2	94.1	96.5	95.4	92.1	90.5	88.4	89.3	92.4
9		Average setup time (hours)	0.30	0.25	0.25	0.30	0.25	0.20	0.20	0.15	0.24
10		Purchase-order lead time (hours)	2.4	2.3	2.2	2.3	2.4	2.4	2.4	2.5	2.4
11		Production cycle time (hours)	2.7	2.6	2.5	2.6	2.6	2.6	2.6	2.7	2.6
12		Average process time (hours)	1.90	1.90	1.85	1.80	1.90	1.95	1.95	1.90	1.89
13		Production backlog (units)	9,210	9,350	9,370	9,420	9,410	8,730	8,310	7,950	8,969
14		Average waste time (hours)	0.50	0.45	0.40	0.50	0.45	0.45	0.45	0.65	0.48
15	c.	Customer Satisfaction									
16		Customer complaints	12	12	10	8	9	7	6	4	8.5
17		Warranty claims	2	4	1	1	—	5	7	11	3.9
18											

2. Memorandum to the division superintendent:

My analysis of the operating data for the division for the last eight weeks revealed the following:

- **Production Performance:** Machine downtime is increasing. Also, the equipment utilization rate is down. Machine maintenance time originally decreased, but it has increased in the past two weeks. Department managers should be aware of these potential problem areas.
- **Delivery Cycle Time:** We are having trouble maintaining the averages for delivery cycle time established eight weeks ago. On-time delivery percentages are slipping. Waste time is increasing, which is contrary to our goals. Backlogged orders are decreasing, which is a good sign from a lean viewpoint but could spell problems in the future. On the positive side, setup time seems to be under control. Emphasis needs to be placed on reducing lead time, cycle time, and process time.
- **Customer Satisfaction:** Customer satisfaction seems to be improving, as the number of complaints is decreasing rapidly. However, warranty claims have risen significantly in the past three weeks, which may be a signal of quality problems.

Overall, we can see good signs from the new equipment, but we need to pay special attention to all potential problem areas.


STOP & REVIEW >
LO1 Describe a management information system, and explain how it enhances management decision making.

In a management information system (MIS), the primary focus is on the management of activities, not on costs. By focusing on activities, an MIS provides managers with improved knowledge of the processes for which they are responsible. The MIS pinpoints resource usage for each activity and fosters managerial decisions that lead to continuous improvement throughout the organization.

As managers plan, they use the MIS database to obtain relevant and reliable information for formulating strategic plans, making forecasts, and preparing budgets. When managers perform their duties, they use the financial and nonfinancial information in the MIS database to implement decisions about personnel, resources, and activities that will minimize waste and improve the quality of their organization's products or services. When they evaluate performance, managers identify and track financial and nonfinancial performance measures to evaluate all major business functions. By enabling the timely comparison of actual to expected performance, the MIS allows managers to reward performance promptly, take speedy corrective actions, and analyze and revise performance measurement plans. And when they communicate, managers are able to generate customized reports that evaluate performance and provide useful real-time information for decision making.

LO2 Define total quality management (TQM), and identify financial and nonfinancial measures of quality.

Total quality management is an organizational environment in which all business functions work together to build quality into a firm's products or services. The costs of quality are measures of the costs that are specifically related to the achievement or nonachievement of product or service quality. The costs of quality have two components. One is the cost of conforming to a customer's product or service standards by preventing defects and failures and by appraising quality and performance. The other is the cost of nonconformance—the costs incurred when defects are discovered before a product is shipped and the costs incurred after a defective product or faulty service is delivered to the customer.

The objective of TQM is to reduce or eliminate the costs of nonconformance, the internal and external failure costs that are associated with customer dissatisfaction. To this end, managers can justify high initial costs of conformance if they minimize the total costs of quality over the product's or service's life cycle.

LO3 Use measures of quality to evaluate operating performance.

Nonfinancial measures of quality are related to product design, vendor performance, production performance, delivery cycle time, and customer satisfaction. Those measures, together with the costs of quality, help a firm meet its goal of continuously improving product or service quality and the production process.

LO4 Discuss the evolving concept of quality.

A manager's concept of quality must continuously evolve to fulfill customers' needs and expectations and to meet the demands of the changing business environment. Quality has many dimensions that extend beyond the mere creation and delivery of a product or service. Managers must satisfy customers today and create innovative products and services for tomorrow. The evolving concept of quality means more than having zero defects in a product or service; it means doing everything possible to have zero defections of customers.

LO5 Recognize the awards and organizations that promote quality.

The importance of quality has been acknowledged worldwide through the granting of numerous awards, certificates, and prizes for quality. Three of the most prestigious awards are the Deming prizes, the EFQM Excellence Award, and the Malcolm Baldrige Quality Award. In addition, the International Organization for Standardization promotes quality management through the ISO 9000 and 14000 families of standards.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Appraisal costs 521 (LO2)	Delivery cycle time 523 (LO2)	Malcolm Baldrige National Quality Award 532 (LO5)
Benchmarking 531 (LO4)	Delivery time 523 (LO2)	Management information system (MIS) 518 (LO1)
Computer-aided design (CAD) 522 (LO2)	Deming prizes 532 (LO5)	Prevention costs 521 (LO2)
Computer-integrated manufacturing (CIM) systems 523 (LO2)	EFQM Excellence Award 532 (LO5)	Process mapping 531 (LO4)
Costs of conformance 520 (LO2)	Enterprise resource planning (ERP) system 518 (LO1)	Production cycle time 523 (LO2)
Costs of nonconformance 520 (LO2)	External failure costs 521 (LO2)	Purchase-order lead time 523 (LO2)
Costs of quality 520 (LO2)	Internal failure costs 521 (LO2)	Quality 520 (LO2)
	ISO 9000 533 (LO5)	Return on quality (ROQ) 530 (LO4)
	ISO 14000 533 (LO5)	Total quality management (TQM) 520 (LO2)
	Kaizen 530 (LO4)	

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Traits of a Management Information System

SE 1. What kinds of information does a management information system capture? How do managers use such information?

L01 Continuous Improvement

SE 2. Maxy Politt is the controller for Pratt Industries. She has been asked to develop a plan for installing a management information system in her company. The president has already approved the concept and has given Politt the go-ahead. What kind of information will Politt need to give managers to help them with their decision making?

L02 Costs of Quality in a Service Business

SE 3. Elam Insurance Agency incurred the following activity costs related to service quality. Identify those that are costs of conformance (CC) and those that are costs of nonconformance (CN).

Policy processing improvements	\$76,400
Customer complaints response	34,100
Policy writer training	12,300
Policy error losses	82,700
Policy proofing	39,500

L02 Measures of Quality

SE 4. Internal reports on quality at the Lakeside Publishing Company generated the following information for the School Division for the first three months of the year:

Total sales	<u>\$50,000,000</u>
Costs of quality:	
Prevention	\$ 523,000
Appraisal	77,000
Internal failure	860,000
External failure	640,000

Compute the following:

- Total costs of quality as a percentage of sales
- Ratio of costs of conformance to total costs of quality
- Ratio of costs of nonconformance to total costs of quality
- Costs of nonconformance as a percentage of total sales

L02 Nonfinancial Measures of Quality

SE 5. For a fast-food restaurant that specializes in deluxe cheeseburgers, identify two nonfinancial measures of good product quality and two nonfinancial measures of poor product quality.

L02 Vendor Quality

SE 6. Cite some specific measures of vendor quality that Nick Michael could use when he installs a quality-certification program for the vendors that supply his company, Stamp It, Inc., with direct materials.

L02 L03 Measures of Delivery Cycle Time

SE 7. Quality Cosmetics, Inc., has developed a set of nonfinancial measures to evaluate on-time product delivery for one of its best-selling cosmetics. The following data have been generated for the past four weeks:

Week	Purchase-Order Lead Time	Production Cycle Time	Delivery Time
1	3.0 days	3.5 days	4.0 days
2	2.3 days	3.5 days	3.5 days
3	2.4 days	3.3 days	3.4 days
4	2.5 days	3.2 days	3.3 days

Compute total delivery cycle time for each week. Evaluate the delivery performance. Is there an area that needs management's attention?

L04 Return on Quality

SE 8. For many years, June Pirolo has used return on quality (ROQ) to evaluate quality. What assumptions about quality did she make?

L04 Quality and Cycle Time

SE 9. **Motorola's** Finance Department has adapted the concept of delivery cycle time to include the measurement of cycle times for processing customer credit memos, invoices, and orders. Why would such performance measures contribute to Motorola's quest for Six Sigma quality?

L05 Quality Award Recipients

SE 10. What types of organizations are represented by recent recipients of the Malcolm Baldrige Award? Consult the website at <http://www.quality.nist.gov>.

Exercises**L01 Adapting to Changing Information Needs**

E 1. "What's all the fuss about managers' needing to focus on activities instead of costs?" demanded Sam Wards, the controller of Tyme Flies. "The bottom line is all that matters, and our company's current management information system is just fine for figuring that out. I know that our system is ten years old, but if it isn't broken, why should we fix it?" How would you respond to Sam Wards?

L02 Costs of Conformance in a Service Business

E 2. Home Health Care, LLP, incurred the following service-related activity costs for the month. Prepare an analysis of the costs of conformance by identifying the prevention costs and appraisal costs, and compute the percentage of sales represented by prevention costs, appraisal costs, and total costs of conformance.

Total sales	\$25,000
Quality training of employees	500
Vendor audits	400
Quality-certified vendors	100
Preventive maintenance	300
Quality sampling of services	200
Field testing of new services	250
Quality circles	50
Quality improvement projects	150
Technical service support	75
Inspection of services rendered	175

L02 Costs of Nonconformance in a Service Business

E 3. Home Health Care, LLP, incurred the following service-related activity costs for the month. Prepare an analysis of the costs of nonconformance by identifying the internal failure costs and external failure costs, and compute the percentage of sales represented by internal failure costs, external failure costs, and total costs of nonconformance.

Total sales	\$25,000
Reinspection of rework	50
Investigation of service defects	300
Lawsuits	0
Quality-related downtime	75
Failure analysis	50
Customer complaint processing	500
Retesting of service scheduling	25
Restoration of reputation	0
Lost sales	100
Replacement services	1,000

L02 Measures of Quality in a Service Business

E 4. Rehab Health Care, LLC, incurred the following service-related activity costs for the month:

Total sales	\$42,000
Customer complaint processing	1,200
Employee training	400
Reinspection and retesting	500
Design review of service procedures	300
Technical support	200
Investigation of service defects	800
Sample testing of vendors	100
Inspection of supplies	150
Quality audits	250
Quality-related downtime	300

Prepare an analysis of the costs of quality for Rehab Health Care, LLC. Categorize the costs as (a) costs of conformance, with subsets of prevention costs and appraisal costs, or (b) costs of nonconformance, with subsets of internal failure costs and external failure costs. Compute the percentage of sales represented by prevention costs, appraisal costs, total costs of conformance, internal failure costs, external failure costs, total costs of nonconformance, and total costs of quality. Also compute the ratio of costs of conformance to total costs of quality and the ratio of costs of nonconformance to total costs of quality.

L02 L03 Costs of Quality

E 5. Lager Corp. produces and supplies automotive manufacturers with the mechanisms used to adjust the positions of front seating units. Several competitors have recently entered the market, and management is concerned that the quality of the company's current products may be surpassed by the quality of the new competitors' products. The controller was asked to conduct an analysis of the efforts in January to improve product quality. His analysis generated the following costs of quality:

Training of employees	\$22,400
Customer service	13,600
Reinspection of rework	28,000

Quality audits	\$31,300
Design review	27,500
Warranty claims	67,100
Sample testing of materials	27,400
Returned goods	98,700
Preventive maintenance	26,500
Quality engineering	18,700
Setup for testing new products	42,100
Scrap and rework	76,500
Losses caused by vendor scrap	65,800
Product simulation	28,400

1. Prepare a detailed analysis of the costs of quality.
2. Comment on the company's current efforts to improve product quality.

L02 L03 Measuring Costs of Quality

E 6. A corporation has two departments that produce two separate product lines. The company has been implementing total quality management over the past year. Revenue and costs of quality for that year are presented below.

	Dept. G	Dept. H	Totals
Annual sales	\$9,200,000	\$11,000,000	\$20,200,000
Costs of quality			
Prevention costs	\$ 186,000	\$ 124,500	\$ 310,500
Appraisal costs	136,000	68,000	204,000
Internal failure costs	94,000	197,500	291,500
External failure costs	44,000	160,000	204,000
Totals	\$ 460,000	\$ 550,000	\$ 1,010,000

Which department is taking a more serious approach to implementing TQM? Base your answer on the following computations:

- a. Total costs of quality as a percentage of sales
- b. Ratio of costs of conformance to total costs of quality
- c. Ratio of costs of nonconformance to total costs of quality
- d. Costs of nonconformance as a percentage of sales

L02 Measures of Product Design Quality

E 7. Being first to market with its newest product, the pocket e-book, was the goal of management at Read It, Inc. Comment on how the company's measures of product design quality, which follow, compare with the industry benchmarks.

Measures of Product Design Quality	Read It, Inc.	Industry Benchmark
Number of design defects detected	50	50
Unresolved design defects at time of product introduction	10	5
Average time between defect detection and correction (hours)	4	8
Time to market (time from design idea to market) (days)	60	100

L02 Measures of Vendor Performance

E 8. Hal Justin, the manager of a hotel that caters to traveling businesspeople, is reviewing the nonfinancial measures of quality for the hotel's dry-cleaning service. Six months ago, he contracted with a local dry-cleaning company to provide the

service to hotel guests. The cleaner promised a four-hour turnaround on all dry-cleaning orders. Comment on the following measures for the last six months.

	January	February	March	April	May	June
Percentage of complaints	1%	2%	1%	2%	2%	1%
Percentage of on-time deliveries	100%	75%	100%	80%	85%	100%
Number of orders	300	400	400	500	600	600

L02 Measures of Production Performance

E 9. Analyze the following nonfinancial measures of quality for Holiday Express, Inc., a supplier of mistletoe, for a recent four-week period. Focus specifically on measures of production performance.

Measures of Quality	Week 1	Week 2	Week 3	Week 4
Percentage of defective products per million produced	1.0%	0.8%	0.6%	0.5%
Equipment utilization rate	90%	91%	89%	90%
Machine downtime (hours)	12	10	13	12
Machine maintenance time (hours)	8	8	8	8
Machine setup time (hours)	4	2	5	4

L02 Measures of Delivery Cycle Time

E 10. Compute the missing numbers for **a**, **b**, **c**, and **d** for the delivery cycle time for Companies M, N, Q, and P.

Company	Purchase-Order Lead Time	Production Cycle Time	Delivery Time	Total Delivery Cycle Time
M	a	2	1	4
N	2	4	b	9
Q	10	c	15	30
P	2	7	1	d

L02 Analysis of Waste Time

E 11. Calculate the missing numbers for **a**, **b**, **c**, and **d** to analyze the waste time for the following orders. Comment on your findings.

Name of Order	Production Cycle Time	Average Process Time	Average Setup Time	Waste Time
Nguyen	6	a	1	1
Smith	b	9	4	2
Gomez	9	5	c	3
Patel	8	3	1	d

L02 L03 Nonfinancial Measures of Quality and TQM

E 12. “A satisfied customer is the most important goal of this company!” was the opening remark of the corporate president, Alice Nunes, at the monthly executive committee meeting of Santiago Company. The company manufactures tube products for customers in 16 western states. It has four divisions, each producing a different type of tubing material. Nunes, a proponent of total quality management, was reacting to the latest measures of quality from the four divisions. The data for the four divisions follow.

	Brass Division	Plastics Division	Aluminum Division	Copper Division	Company Averages
Vendor on-time delivery	97.20%	91.40%	98.10%	88.20%	93.73%*
Production quality rates (defective parts per million)	1,440	2,720	1,370	4,470	2,500
On-time shipments	89.20%	78.40%	91.80%	75.60%	83.75%
Returned orders	1.10%	4.60%	0.80%	6.90%	3.35%
Number of customer complaints	24	56	10	62	38
Number of warranty claims	7	12	4	14	9.3*

*Rounded.

Why was Nunes upset? Which division or divisions do not appear to have satisfied customers? What criteria did you use to make your decision?

L04 Nonfinancial Data Analysis

E 13. Takada Company makes racing bicycles. Its Lightning model is considered the top of the line in the industry. Three months ago, to improve quality and reduce production time, Takada Company purchased and installed a computer-integrated manufacturing system for the Lightning model. Management is interested in cutting time in all phases of the delivery cycle. The controller's office gathered these data for the past four-week period:

	Week			
	1	2	3	4
Average process time (hours)	24.6	24.4	23.8	23.2
Average setup time (hours)	1.4	1.3	1.2	1.1
Customer complaints	7	6	8	9
Delivery time (hours)	34.8	35.2	36.4	38.2
On-time deliveries (%)	98.1	97.7	97.2	96.3
Production backlog (units)	8,230	8,340	8,320	8,430
Production cycle time (hours)	28.5	27.9	27.2	26.4
Purchase-order lead time (hours)	38.5	36.2	35.5	34.1
Warranty claims	2	3	3	2

Analyze the performance of the Lightning model for the four-week period, focusing specifically on product delivery cycle time and on customer satisfaction.

L04 Innovation and Quality

E 14. Ecommerce has changed the way goods and services are obtained. How do companies like **Barnes and Noble** or **Borders** or **Books-A-Million** continue to anticipate customer needs? To answer this question, visit their websites.

L05 Quality Awards

E 15. How do the Malcolm Baldrige Quality Award and the ISO 9000 standards differ? Consult their websites at www.quality.nist.gov and www.iso.org.

Problems**L02 Costs and Nonfinancial Measures of Quality**

P 1. Minturn Enterprises, Inc., operates as three autonomous companies, each with a chief executive officer who oversees its operations. At a recent corporate meeting, the company CEOs agreed to adopt total quality management and to track, record, and analyze their costs and nonfinancial measures of quality. All three companies are operating in highly competitive markets. Sales and quality-related data for September follow.

	Carbondale Company	Wolcott Company	Silverthorne Company
Annual sales	\$11,600,000	\$13,300,000	\$10,800,000
Costs of quality			
Vendor audits	\$ 69,000	\$ 184,800	\$ 130,800
Quality audits	58,900	115,550	141,700
Failure analysis	188,500	92,400	16,350
Design review of products	80,500	176,700	218,000
Scrap and rework	207,000	160,800	21,200
Quality-certified suppliers	49,200	105,600	231,600
Preventive maintenance	92,000	158,400	163,500
Warranty adjustments	149,550	105,600	49,050
Product recalls	201,250	198,000	80,050
Quality training of employees	149,500	237,600	272,500
End-of-process sampling and testing	34,500	145,200	202,700
Reinspection of rework	126,500	66,000	27,250
Returned goods	212,750	72,600	16,350
Customer complaint processing	109,250	162,450	38,150
Total costs of quality	<u>\$ 1,728,400</u>	<u>\$ 1,981,700</u>	<u>\$ 1,609,200</u>
Nonfinancial measures of quality			
Number of warranty claims	61	36	12
Customer complaints	107	52	18
Defective parts per million	4,610	2,190	1,012
Returned orders	9.20%	4.10%	0.90%

Required

1. Prepare an analysis of the costs of quality for the three divisions. Categorize the costs as (a) costs of conformance, with subsets of prevention costs and appraisal costs, or (b) costs of nonconformance, with subsets of internal failure costs and external failure costs. Compute the total costs in each category for each company.

Manager insight ►

- For each company compute the percentage of sales represented by prevention costs, appraisal costs, total costs of conformance, internal failure costs, external failure costs, total costs of nonconformance, and total costs of quality.
- Interpret the cost-of-quality data for each company. Is its product of high or low quality? Why? Is each company headed in the right direction to be competitive?
- Evaluate the nonfinancial measures of quality in terms of customer satisfaction. Are the results consistent with your analysis in requirement 3? Explain your answer.

L02 L03 Analysis of Nonfinancial Data

P 2. Enterprises, Inc., manufactures several lines of small machinery. Before the company installed automated equipment, the total delivery cycle time for its Coin machine models averaged about three weeks. Last year, management decided to purchase a new computer-integrated manufacturing system for the Coin line. The following is a summary of operating data for the past eight weeks for the Coin line:

	Week							
	1	2	3	4	5	6	7	8
Average process time (hours)	7.20	7.20	7.10	7.40	7.60	7.20	6.80	6.60
Average setup time (hours)	2.20	2.20	2.10	1.90	1.90	1.80	2.00	1.90
Customer complaints	5	6	4	7	6	8	9	9
Delivery time (hours)	36.20	37.40	37.20	36.40	35.90	35.80	34.80	34.20
Equipment utilization rate (%)	98.10	98.20	98.40	98.10	97.80	97.60	97.80	97.80
Machine downtime (hours)	82.30	84.20	85.90	84.30	83.40	82.20	82.80	80.40
Machine maintenance time (hours)	50.40	52.80	49.50	46.40	47.20	45.80	44.80	42.90
On-time deliveries (%)	92.40	92.50	93.20	94.20	94.40	94.10	95.80	94.60
Production backlog (units)	15,230	15,440	15,200	16,100	14,890	13,560	13,980	13,440
Production cycle time (hours)	12.20	12.60	11.90	11.80	12.20	11.60	11.20	10.60
Purchase-order lead time (hours)	26.20	26.80	26.50	25.90	25.70	25.30	24.80	24.20
Warranty claims	2	2	3	2	3	4	3	3

Required

- Analyze the performance of the Coin machine line for the eight-week period. Focus on performance in the following areas. Carry your answers to two decimal places.
 - Production performance
 - Delivery cycle time, including computations of delivery cycle time and waste time
 - Customer satisfaction
- Summarize your findings in a report to the company's president, Wilhem Devore.

L02 Costs of Quality

P 3. Karen Setten, regional manager of Heavenly Pies, is evaluating the performance of four pie kitchens in her region. In accordance with the company’s costs-of-quality standards of performance, the four locations provided these data for the past six months:

	Aspen	Basalt	Frisco	Dillon
Sales	\$1,800,000	\$1,500,000	\$1,400,000	\$1,200,000
Prevention costs	\$ 32,000	\$ 48,000	\$ 16,000	\$ 20,000
Appraisal costs	42,000	32,000	18,000	25,000
Internal failure costs	24,000	21,000	42,000	30,000
External failure costs	3,000	16,000	45,000	5,000
Total costs of quality	<u>\$ 131,000</u>	<u>\$ 117,000</u>	<u>\$ 121,000</u>	<u>\$ 100,000</u>

Required

1. For each location, compute the percentages of sales represented by prevention costs, appraisal costs, total costs of conformance, internal failure costs, external failure costs, total costs of nonconformance, and total costs of quality. Carry your answers to two decimal places.
2. For each location, calculate the ratio of costs of conformance to costs of quality and the ratio of costs of nonconformance to costs of quality.
3. Interpret the cost-of-quality data for each location. Rank the locations in terms of quality.

Manager insight ►

L02 L03 Interpreting Measures of Quality

P 4. Watts Corporation supplies electronic circuitry to major appliance manufacturers in all parts of the world. Producing a high-quality product in each of the company’s four divisions is the mission of management. Each division is required to record and report its efforts to achieve quality in all of its primary product lines. The following information for the most recent three-month period was submitted to the chief financial officer:

	<u>Glenwood Division</u>		<u>Lakes Division</u>		<u>Springs Division</u>		<u>Gilman Division</u>	
	Amount	% of Revenue	Amount	% of Revenue	Amount	% of Revenue	Amount	% of Revenue
Costs of Quality								
Costs of Conformance								
Prevention costs:								
Quality training of employees	\$ 4,400		\$ 15,600		\$ 23,600		\$ 8,900	
Process engineering	3,100		19,700		45,900		9,400	
Preventive maintenance	<u>5,800</u>		<u>14,400</u>		<u>13,800</u>		<u>11,100</u>	
Total prevention costs	<u>\$ 13,300</u>	<u>0.95%</u>	<u>\$ 49,700</u>	<u>3.11%</u>	<u>\$ 83,300</u>	<u>5.55%</u>	<u>\$ 29,400</u>	<u>1.73%</u>

(continued)

	<u>Glenwood Division</u>		<u>Lakes Division</u>		<u>Springs Division</u>		<u>Gilman Division</u>	
	<u>Amount</u>	<u>% of Revenue</u>	<u>Amount</u>	<u>% of Revenue</u>	<u>Amount</u>	<u>% of Revenue</u>	<u>Amount</u>	<u>% of Revenue</u>
Appraisal costs:								
End-of-process sampling and testing	\$ 3,500		\$ 19,500		\$ 21,400		\$ 6,900	
Quality audits of products	6,100		11,900		17,600		8,700	
Vendor audits	<u>4,100</u>		<u>10,100</u>		<u>9,800</u>		<u>7,300</u>	
Total appraisal costs	<u>\$ 13,700</u>	<u>0.98%</u>	<u>\$ 41,500</u>	<u>2.59%</u>	<u>\$ 48,800</u>	<u>3.25%</u>	<u>\$ 22,900</u>	<u>1.35%</u>
Total costs of conformance	<u>\$ 27,000</u>	<u>1.93%</u>	<u>\$ 91,200</u>	<u>5.70%</u>	<u>\$132,100</u>	<u>8.80%</u>	<u>\$ 52,300</u>	<u>3.08%</u>
Costs of Nonconformance								
Internal failure costs:								
Quality-related downtime	\$ 26,800		\$ 8,300		\$ 6,500		\$ 22,600	
Scrap and rework	17,500		9,100		7,800		16,200	
Scrap disposal losses	<u>31,200</u>		<u>7,200</u>		<u>3,600</u>		<u>19,900</u>	
Total internal failure costs	<u>\$ 75,500</u>	<u>5.39%</u>	<u>\$ 24,600</u>	<u>1.54%</u>	<u>\$ 17,900</u>	<u>1.19%</u>	<u>\$ 58,700</u>	<u>3.45%</u>
External failure costs:								
Warranty claims	\$ 22,600		\$ 4,400		\$ 2,500		\$ 17,100	
Customer complaint processing	31,600		8,100		6,400		22,300	
Returned goods	<u>29,900</u>		<u>5,600</u>		<u>3,100</u>		<u>19,800</u>	
Total external failure costs	<u>\$ 84,100</u>	<u>6.01%</u>	<u>\$ 18,100</u>	<u>1.13%</u>	<u>\$ 12,000</u>	<u>0.80%</u>	<u>\$ 59,200</u>	<u>3.48%</u>
Total costs of nonconformance	<u>\$159,600</u>	<u>11.40%</u>	<u>\$ 42,700</u>	<u>2.67%</u>	<u>\$ 29,900</u>	<u>1.99%</u>	<u>\$117,900</u>	<u>6.93%</u>
Total costs of quality	<u>\$186,600</u>	<u>13.33%</u>	<u>\$133,900</u>	<u>8.37%</u>	<u>\$162,000</u>	<u>10.79%</u>	<u>\$170,200</u>	<u>10.01%</u>

Ratios of Nonfinancial**Measures:**

Number of sales to number of warranty claims	168 to 1	372 to 1	996 to 1	225 to 1
Number of products produced to number of products reworked	1,420 to 1	3,257 to 1	6,430 to 1	2,140 to 1
Change in throughput time (positive amount means time reduction)	(-4.615%)	2.163%	5.600%	(-1.241%)
Total number of deliveries to number of late deliveries	86 to 1	168 to 1	290 to 1	128 to 1

Required

- Manager insight ►**
- Rank the divisions in order of their apparent product quality.
 - What three measures were most important in your rankings in 1? Why?
 - Which division is most successful in its bid to improve quality? What measures illustrate its high-quality rating?
 - Consider the two divisions producing the lowest-quality products. What actions would you recommend to the management of each division? Where should their quality dollars be spent?

Alternate Problems**L02 Costs and Nonfinancial Measures of Quality**

P 5. The Janelle Company operates as three autonomous divisions. Each division has a general manager in charge of product development, production, and distribution. Management recently adopted total quality management, and the divisions now track, record, and analyze their costs and nonfinancial measures of quality. All three divisions are operating in highly competitive marketplaces. Sales and quality-related data for April are summarized below.

	East Division	Central Division	West Division
Annual sales	\$8,500,000	\$9,500,000	\$13,000,000
Costs of quality			
Field testing	\$ 51,600	\$ 112,800	\$ 183,950
Quality audits	17,200	79,100	109,650
Failure analysis	103,100	14,700	92,700
Quality training of employees	60,200	188,000	167,700
Scrap and rework	151,000	18,800	154,800
Quality-certified suppliers	34,400	94,000	108,200
Preventive maintenance	65,800	148,000	141,900
Warranty claims	107,500	42,300	106,050
Customer complaint processing	151,500	108,100	154,800
Process engineering	94,600	235,000	232,200
End-of-process sampling and testing	24,700	178,600	141,900
Scrap disposal losses	77,400	23,500	64,500
Returned goods	152,500	16,200	45,150
Product recalls	64,500	32,900	64,500
Total costs of quality	<u>\$1,156,000</u>	<u>\$1,292,000</u>	<u>\$ 1,768,000</u>
Nonfinancial measures of quality			
Defective parts per million	3,410	1,104	1,940
Returned orders	7.40%	1.10%	3.20%
Customer complaints	62	12	30
Number of warranty claims	74	16	52

Required

- Prepare an analysis of the costs of quality for the three divisions. Categorize the costs as (a) costs of conformance, with subsets of prevention costs and appraisal costs, or (b) costs of nonconformance, with subsets of internal failure costs and external failure costs. Compute the total costs for each category for each division.

Manager insight ►

- For each division, compute the percentage of sales represented by prevention costs, appraisal costs, total costs of conformance, internal failure costs, external failure costs, total costs of nonconformance, and total costs of quality.
- Interpret the cost-of-quality data for each division. Is each division's product of high or low quality? Explain your answers. Are the divisions headed in the right direction to be competitive?
- Evaluate the nonfinancial measures of quality in terms of customer satisfaction. Are the results consistent with your analysis in requirement 3? Explain your answers.

L02 L03 Analysis of Nonfinancial Data

P 6. Park Electronics Company is known for its high-quality products and on-time deliveries. Six months ago, it installed a computer-integrated manufacturing system in its Sensitive Components Department. The new equipment produces the entire component, so the finished product is ready to be shipped when needed. During the past eight-week period, the controller's staff gathered the data that appear below.

	Week							
	1	2	3	4	5	6	7	8
Average process time (hours)	10.90	11.10	10.60	10.80	11.20	11.80	12.20	13.60
Average setup time (hours)	2.50	2.60	2.60	2.80	2.70	2.40	2.20	2.20
Customer complaints	11	10	23	15	9	7	5	6
Delivery time (hours)	26.20	26.40	26.10	25.90	26.20	26.60	27.10	26.40
Equipment utilization rate (%)	96.20	96.10	96.30	97.20	97.40	96.20	96.40	95.30
Machine downtime (hours)	106.40	108.10	120.20	110.40	112.80	102.20	124.60	136.20
Machine maintenance time (hours)	64.80	66.70	72.60	74.20	76.80	66.60	80.40	88.20
On-time deliveries (%)	97.20	97.50	97.60	98.20	98.40	96.40	94.80	92.60
Production backlog (units)	10,246	10,288	10,450	10,680	10,880	11,280	11,350	12,100
Production cycle time (hours)	16.50	16.40	16.30	16.10	16.30	17.60	19.80	21.80
Purchase-order lead time (hours)	15.20	15.10	14.90	14.60	14.60	13.20	12.40	12.60
Warranty claims	4	8	2	1	6	4	2	3

Required

- Analyze the performance of the Sensitive Components Department for the eight-week period. Focus on performance in the following areas: (a) production performance, (b) delivery cycle time (include computations of delivery cycle time and waste time), and (c) customer satisfaction. Carry your answers to two decimal places.
- Summarize your findings in a report to the department's superintendent, André Park.

L02 Costs of Quality

P 7. Creed Napier, the regional manager of E-Taxes, Inc., is evaluating the performance of four ecommerce tax preparation sites in her region. The following data for the past six months were presented to her by each site in accordance with the company's costs-of-quality standards of performance:

	Small Business Portal	Big Business Portal	Self-Employed Portal	Partnership Portal
Sales	\$5,000,000	\$10,000,000	\$8,000,000	\$6,000,000
Prevention costs	\$ 62,000	\$ 58,000	\$ 16,000	\$ 20,000
Appraisal costs	32,000	42,000	28,000	15,000
Internal failure costs	54,000	31,000	32,000	40,000
External failure costs	3,000	26,000	55,000	35,000
Total costs of quality	<u>\$ 171,000</u>	<u>\$ 157,000</u>	<u>\$ 131,000</u>	<u>\$ 110,000</u>

Required

- For each site, compute the percentages of sales represented by prevention costs, appraisal costs, total costs of conformance, internal failure costs, external failure costs, total costs of nonconformance, and total costs of quality.
- For each site, calculate the ratio of costs of conformance to costs of quality and the ratio of costs of nonconformance to costs of quality.
- Interpret the cost-of-quality data for each site. Rank the sites in terms of quality.

Manager insight ►

L02 L03 Interpreting Measures of Quality

P 8. Travis Corporation has five divisions, each manufacturing a product line that competes in the global marketplace. The company is planning to compete for the Malcolm Baldrige Award, so management requires that each division record and report its efforts to achieve quality in its product line. The information below was submitted to the company’s controller for the most recent six-month period.

	A	B	C	D	E	F	G	H
				Division A	Division B	Division C	Division D	Division E
1								
2	Total Revenue			\$886,000	\$1,040,000	\$956,000	\$1,225,000	\$1,540,000
3	Costs of Quality							
4	Customer complaint processing			\$ 10,400	\$ 12,600	\$ 12,300	\$ 10,100	\$ 15,600
5	Scrap and rework			26,800	13,500	38,700	11,900	34,800
6	Quality audits of products			13,600	28,400	6,300	25,600	11,700
7	Returned goods			18,700	11,400	38,400	11,300	36,000
8	Warranty claims			21,100	6,400	36,200	6,500	42,600
9	Quality training of employees			8,900	12,600	4,600	11,400	4,200
10	Preventive maintenance			11,300	18,700	8,300	13,600	6,300
11	Failure analysis			34,800	9,800	46,900	10,200	56,900
12	Inspection of materials			12,500	18,700	7,800	17,500	5,600
13	Nonfinancial Measures of Quality							
14	Number of warranty claims versus			22	12	46	12	62
15	number of sales			6,500	8,900	7,200	9,800	9,600
16	Number of products reworked versus			150	140	870	70	900
17	number of products manufactured			325,000	456,000	365,000	450,000	315,600
18	Throughput time in hours versus			6.20	8.50	6.80	9.20	11.60
19								

Required

- Prepare an analysis of the costs of quality for each division. Categorize the costs as costs of conformance or costs of nonconformance. Carry your answers to two decimal places.

Manager insight ►

2. For each division, compute the percentage of total revenue for each of the four cost-of-quality categories and the ratios for the nonfinancial data.
3. Rank the divisions in order of their apparent product quality.
4. What three measures were most important in your rankings in requirement 3? Why?
5. Which division has been most successful in its bid to improve quality? What measures illustrate its high quality rating?
6. Consider the two divisions producing the lowest-quality products. What actions would you recommend to the management of each division? Where should their quality dollars be spent?

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 MIS and Ethics

C 1. Three months ago, Maxwell Enterprises hired a consultant, Stacy Slone, to assist in the design and installation of a new management information system for the company. Mike Cams, one of Maxwell's systems design engineers, was assigned to work with Slone on the project. During the three-month period, Slone and Cams met six times and developed a tentative design and installation plan for the MIS. Before the plan was to be unveiled to top management, Cams asked his supervisor, Todd Bowman, to look it over and comment on the design.

Included in the plan was the consolidation of three engineering functions into one. Both of the supervisors of the other two functions had seniority over Bowman, so he believed that the design would lead to his losing his management position. He communicated this to Cams and ended his comments with the following statement: "If you don't redesign the system to accommodate all three of the existing engineering functions, I will give you an unsatisfactory performance evaluation for this year!"

How should Cams respond to Bowman's assertion? Should he handle the problem alone, keeping it inside the company, or communicate the comment to Slone? Outline Cams's options, and be prepared to discuss them in class.

LO2 LO3 Evaluating Performance Measures

C 2. Ahern Company and Siedle Company compete in the same industry. Each company is located in a large midwestern city, and each employs between 300 and 350 people. Both companies have adopted a total quality management approach, and both want to improve their ability to compete in the marketplace. They have installed common performance measures to help track their quest for quality and a competitive advantage.

During the most recent three-month period, Ahern Company and Siedle Company generated the data that follow.

Performance Measures	Ahern Company		Siedle Company	
	Financial	Nonfinancial	Financial	Nonfinancial
Production performance				
Equipment utilization rate		89.4%		92.1%
Machine downtime (in machine hours)		720		490
Delivery cycle time				
On-time deliveries		92.1%		96.5%
Purchase-order lead time (hours)		17		18
Production cycle time (hours)		14		16
Waste time (hours)		3		2
Customer satisfaction				
Customer complaints		28		24
Scrap and rework costs	\$14,390		\$13,680	
Field service costs	9,240		7,700	

1. For each measure, indicate which company has the better performance.
2. Which company is more successful in achieving a total quality environment and an improved competitive position? Explain your answer.

L02 L03 Reports on Quality Data

C3. Jim Macklin is chief executive officer of Red Cliff Machinery, Inc. The company adopted a JIT operating environment five years ago. Since then, each segment of the company has been converted, and a complete computer-integrated manufacturing system operates in all parts of the company's five plants. Processing of Red Cliff Machinery's products now averages less than four days once the materials have been put into production.

Macklin is worried about customer satisfaction and has asked you, as the controller, for some advice and help. He has also asked the Marketing Department to perform a quick survey of customers to determine weak areas in customer relations. Here is a summary of four customers' replies:

Customer A: Customer for five years; waits an average of six weeks for delivery; located 1,200 miles from plant; returns an average of 3 percent of products; receives 90 percent on-time deliveries; never hears from sales person after placing order; likes quality or would go with competitor.

Customer B: Customer for seven years; waits an average of five weeks for delivery; orders usually sit in backlog for at least three weeks; located 50 miles from plant; returns about 5 percent of products; receives 95 percent on-time deliveries; has great rapport with sales person; sales person is why this customer is loyal.

Customer C: Customer for twelve years; waits an average of seven weeks for delivery; located 1,500 miles from plant; returns about 4 percent of products; receives 92 percent on-time deliveries; sales person is available but of little help in getting faster delivery; customer is thinking about dealing with another source for its product needs.

Customer D: Customer for fifteen years; very pleased with company's product; waits almost five weeks for delivery; located 120 miles from plant; returns only 2 percent of goods received; rapport with sales person is very good; follow-up

service of sales person is excellent; would like delivery cycle time reduced to equal that of competitors; usually deals with three-week backlog.

1. Identify the areas of concern, and give at least three examples of reports that will help managers improve the company's response to customer needs.
2. Assume that you are asked to write a report that will provide information about customer satisfaction. In preparation for writing the report, answer the following questions:
 - a. What kinds of information do you need to prepare this report?
 - b. Why is this information relevant?
 - c. Where would you find this information (i.e., what sources would you use)?
 - d. When would you want to obtain this information?

LO4 Quality Measures and Techniques

C 4. Motorola's Total Customer Satisfaction (TCS) Teams are cross-functional teams that use customer-focused methods to solve quality and process problems. According to Motorola's website, one TCS Team success story involved an international supplier with quality and delivery problems. These problems required additional order expediting and rework and were causing customer dissatisfaction. The TCS Team's report to management disclosed the following:

- By evaluating and revising the product's design with input from the international supplier, the team created a more robust finished product.
 - The team's adoption of process capability studies, together with continuous monitoring, resulted in improved quality for the international supplier.
 - When sourcing was moved to a local supplier, the number of times the inventory turned over annually improved. It went from 26 to 52 times a year.
 - Over the three-year life of the product, the team's changes resulted in \$831,438 in cost savings.
1. From the TCS Team's report, identify the key issues involved in solving the international supplier's quality and process problems.
 2. How could the team have applied the process-based techniques of benchmarking and process mapping to improve quality?

LO4 Cookie Company (Continuing Case)

C 5. In this chapter, in preparation for developing a website for your company, you will compare the quality of cookie manufacturers' websites. Visit three sites from the following list:

- www.CherylandCo.com
- www.DavidsCookies.com
- www.famous-amos.com
- www.Gojjigourmet.com
- www.MrsFields.com

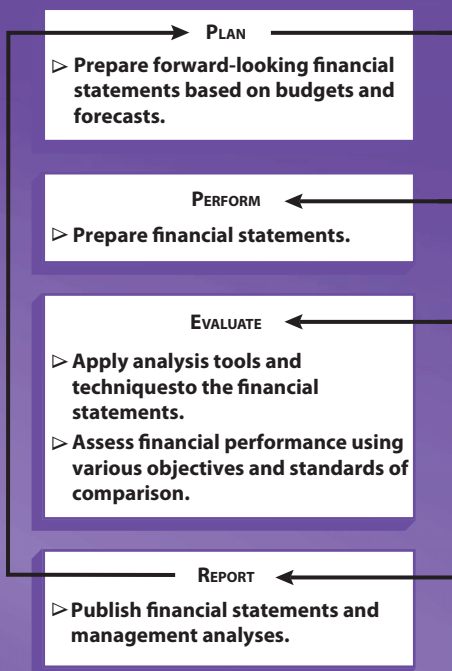
What features does each site offer its customers? Do the sites offer both pre- and post-sale assistance? In your opinion, how have these websites affected the way cookies are sold? What features will your company's website have?

CHAPTER

14

Financial Analysis of Performance

The Management Process



Comparisons within and across financial statements help managers assess financial performance.

The purpose of financial reporting is to communicate to creditors, investors, and other interested parties the financial results of a business in a useful and understandable way. The fundamental responsibility for reporting those financial results rests with the business's management. When the financial statements are published in quarterly or annual reports, managers are required to analyze and discuss company performance results. External parties use these unaudited manager insights along with the audited financial statements to evaluate a company's financial performance and judge management effectiveness. Because financial measures play a key role in executive compensation, there is always the risk that they will be manipulated. External users of financial statements therefore need to be familiar with the analytical tools and techniques used in financial performance analysis and the assumptions that underlie them.

LEARNING OBJECTIVES

- LO1** Describe the objectives, standards of comparison, sources of information, and compensation issues in measuring financial performance. (pp. 556–563)
- LO2** Apply horizontal analysis, trend analysis, vertical analysis, and ratio analysis to financial statements. (pp. 563–570)
- LO3** Apply ratio analysis to financial statements in a comprehensive evaluation of a company's financial performance. (pp. 571–578)

DECISION POINT ► A MANAGER'S FOCUS STARBUCKS CORPORATION

Formed in 1985, **Starbucks** is today the world's leading roaster and retailer of specialty coffee. The company purchases and roasts whole coffee beans and sells them, along with a variety of freshly brewed coffees and other beverages, food items, and coffee-related merchandise, in its retail shops. It also produces and sells bottled coffee drinks, a line of premium ice creams, and, most recently, instant coffee products. Starbucks is one of the most recognized and respected brands in the world.

Like many other companies, Starbucks uses financial performance measures, primarily earnings per share, in determining compensation for top management. Earnings per share and some of the measures that drive earnings per share appear in the company's annual report and are shown in the Financial Highlights below.¹ By linking compensation to financial performance, Starbucks provides its executives with incentive to improve the company's performance. Compensation and financial performance are thus linked to increasing shareholders' value.

STARBUCKS' FINANCIAL HIGHLIGHTS

(In millions, except profit margin and earnings per share)

	2008	2007	2006	2005
Net revenues	\$10,383.0	\$9,411.5	\$7,786.9	\$6,369.3
Net earnings	\$315.5	\$672.6	\$564.3	\$494.4
Profit margin	3.0%	7.1%	7.2%	7.8%
Earnings per share—basic	\$0.43	\$0.90	\$0.74	\$0.63

- What standards should be used to evaluate Starbucks' performance?
- What analytical tools are available to measure performance?
- How successful has the company's management been in creating value for shareholders?



Foundations of Financial Performance Measurement

LO1 Describe the objectives, standards of comparison, sources of information, and compensation issues in measuring financial performance.

Financial performance measurement, also called *financial statement analysis*, uses all the techniques available to show how important items in a company's financial statements relate to the company's financial objectives. Persons with a strong interest in measuring a company's financial performance fall into two groups:

1. A company's top managers, who set and strive to achieve financial performance objectives; middle-level managers of business processes; and lower-level employees who own stock in the company
2. Creditors and investors, as well as customers who have cooperative agreements with the company

Financial Performance Measurement: Management's Objectives

All the strategic and operating plans that management formulates to achieve a company's goals must eventually be stated in terms of financial objectives. A primary objective is to increase the wealth of the company's stockholders, but this objective must be divided into categories. A complete financial plan should have financial objectives and related performance objectives in all the following categories:

<i>Financial Objective</i>	<i>Performance Objective</i>
Liquidity	The company must be able to pay bills when due and meet unexpected needs for cash.
Profitability	It must earn a satisfactory net income.
Long-term solvency	It must be able to survive for many years.
Cash flow adequacy	It must generate sufficient cash through operating, investing, and financing activities.
Market strength	It must be able to increase stockholders' wealth.

One of management's primary responsibilities is to achieve the company's financial objectives. This requires:

- ▶ Monitoring key financial performance measures constantly for each objective listed above.
- ▶ Determining the cause of any deviations from the measures, and taking corrective action.
- ▶ Comparing actual performance with the key performance measures in monthly, quarterly, and annual reports.
- ▶ Providing information and data for long-term trend analyses.

Managers communicate financial plans, risks, and results on the company website, in published reports, and in press releases. Many of these reports are required by the Securities and Exchange Commission (SEC) for publicly traded companies. They are public documents and can be viewed by anyone.

Financial Performance Measurement: Creditors' and Investors' Objectives

Creditors and investors use financial performance evaluation to judge a company's past performance and present position. They also use it to assess a company's future potential and the risk connected with acting on that potential.

- ▶ An investor focuses on a company's potential earnings ability because that ability will affect the market price of the company's stock and the amount of dividends the company will pay.
- ▶ A creditor focuses on the company's potential debt-paying ability.

Past performance is often a good indicator of future performance. To evaluate a company's past performance, creditors and investors look at trends in past sales, expenses, net income, cash flow, and return on investment. To evaluate its current position, they look at its assets, liabilities, cash position, debt in relation to equity, and levels of inventories and receivables. Knowing a company's past performance and current position can be important in judging its future potential and the related risk. The risk involved in making an investment or loan depends on how easy it is to predict future profitability or liquidity.

- ▶ In return for taking a greater risk, investors often look for a higher expected return (an increase in market price plus dividends).
- ▶ Creditors who take a greater risk by advancing funds to a new company may demand a higher interest rate and more assurance of repayment (a secured loan, for instance). The higher interest rate reimburses them for assuming the higher risk.

Standards of Comparison

When analyzing financial statements, decision makers must judge whether the relationships they find in the statements are favorable or unfavorable. Three standards of comparison that they commonly use are rule-of-thumb measures, a company's past performance, and industry norms.

Study Note

Rules of thumb evolve and change as the business environment changes. Not long ago, an acceptable current ratio was higher than today's 2:1.

Rule-of-Thumb Measures Many managers, financial analysts, investors, and lenders apply general standards, or rule-of-thumb measures, to key financial ratios. For example, most analysts today agree that a current ratio (current assets divided by current liabilities) of 2:1 is acceptable.

In its *Industry Norms and Key Business Ratios*, the credit-rating firm of Dun & Bradstreet offers such rules of thumb as the following:

- ▶ **Current debt to tangible net worth:** A business is usually in trouble when this relationship exceeds 80 percent.
- ▶ **Inventory to net working capital:** Ordinarily, this relationship should not exceed 80 percent.

Although rule-of-thumb measures may suggest areas that need further investigation, there is no proof that the levels they specify apply to all companies. A company with a current ratio higher than 2:1 may have a poor credit policy (causing accounts receivable to be too large), too much inventory, or poor cash management. Another company may have a ratio lower than 2:1 but still have excellent management in all three of those areas. Thus, rule-of-thumb measures must be used with caution.

Past Performance Comparing financial measures or ratios of the same company over time is an improvement over using rule-of-thumb measures. Such a comparison gives the analyst some basis for judging whether the measure or ratio is getting better or worse. Thus, it may be helpful in showing future trends. However, trends reverse at times, so such projections must be made with care.

Another problem with analyzing trends is that past performance may not be enough to meet a company's present needs. For example, even though a company improves its return on investment from 3 percent in one year to 4 percent the next year, the 4 percent return may not be adequate for the company's current needs. In addition, using a company's past performance as a standard of comparison is not helpful in judging its performance relative to that of other companies.

Industry Norms Using industry norms as a standard of comparison overcomes some of the limitations of comparing a company's measures or ratios over time. Industry norms show how a company compares with other companies in the same industry. For example, if companies in a particular industry have an average rate of return on investment of 8 percent, a 3 or 4 percent rate of return is probably not adequate. Industry norms can also be used to judge trends. Suppose that because of a downturn in the economy, a company's profit margin dropped from 12 percent to 10 percent, while the average drop in profit margin of other companies in the same industry was from 12 to 4 percent. By this standard, the company would have done relatively well. Sometimes, instead of industry averages, data for the industry leader or a specific competitor are used for analysis.

Using industry norms as a standard of comparison has three limitations:

1. Companies in the same industry may not be strictly comparable. For example, consider two companies in the oil industry. One purchases oil products and markets them through service stations. The other, an international company, discovers, produces, refines, and markets its own oil products. Because of the disparity in their operations, these two companies cannot be directly compared.
2. Many large companies have multiple segments and operate in more than one industry. Some of these **diversified companies**, or *conglomerates*, operate in many unrelated industries. The individual segments of a diversified company generally have different rates of profitability and different degrees of risk. In analyzing a diversified company's consolidated financial statements, it is often impossible to use industry norms as a standard because there simply are no comparable companies.
 - ▶ The FASB provides a partial solution to this problem. It requires diversified companies to report profit or loss, certain revenue and expense items, and assets for each of their segments. Segment information may be



FOCUS ON BUSINESS PRACTICE

Look Carefully at the Numbers

In recent years, companies have increasingly used pro forma statements—statements as they would appear without certain items—as a way of presenting a better picture of their operations than would be the case in reports prepared under GAAP. In one quarter, **Amazon.com** reported a “pro forma net” loss of \$76 million; under GAAP, its net loss was \$234 million. Pro forma statements, which are unaudited, have come to mean whatever a company's management wants them to mean. As a result, the SEC has issued new rules that prohibit companies from giving more

prominence to non-GAAP measures and from using terms that are similar to GAAP measures.² Nevertheless, companies still report pro forma results. A common practice of companies such as **Google**, **eBay**, and **Starbucks** is to provide in the notes to the financial statements income as it would be without the expense related to compensation for stock options.³ Analysts should rely exclusively on financial statements that are prepared using GAAP and that are audited by an independent CPA.

reported for operations in different industries or different geographical areas, or for major customers.⁴

- ▶ Exhibit 14-1 shows how **Starbucks** reports data on sales, income, and assets for its United States, International, and Global Consumer Products Group (CPG) segments.
- ▶ These data allow the analyst to compute important profitability performance measures, such as profit margin, asset turnover, and return on assets, for each segment and to compare them with the appropriate industry norms.

Study Note

Each segment of a diversified company represents an investment that the home office or parent company evaluates and reviews frequently.

3. Another limitation of industry norms is that even when companies in the same industry have similar operations, they may use different acceptable accounting procedures. For example, they may use different methods of valuing inventories and different methods of depreciating assets.

Despite these limitations, if little information about a company's past performance is available, industry norms probably offer the best available standards for judging current performance—as long as they are used with care.

Sources of Information

The major sources of information about public corporations are reports published by the corporations themselves, reports filed with the SEC, business periodicals, and credit and investment advisory services.

Reports Published by the Corporation A public corporation's annual report is an important source of financial information. Management is responsible for publishing these reports. From a financial analyst's perspective, the main parts of an annual report are management's analysis of the past year's operations; the financial statements; the notes to the financial statements, which include a summary of significant accounting policies; the auditors' report; and financial highlights for a five- or ten-year period.

Most public corporations also publish **interim financial statements** each quarter and sometimes each month. These reports, which present limited information in the form of condensed financial statements, are not subject to a full audit by an independent auditor. The financial community watches interim statements closely for early signs of change in a company's earnings trend.

Reports Filed with the SEC Public corporations in the United States must file annual reports, quarterly reports, and current reports with the Securities and Exchange Commission (SEC). If they have more than \$10 million in assets and more than 500 shareholders, they must file these reports electronically at www.sec.gov/edgar.shtml, where anyone can access them free of charge.

- ▶ **Form 10-K:** The SEC requires companies to file their annual reports on a standard form, called Form 10-K. Form 10-K contains more information than a company's annual report and is therefore a valuable source of information. Analysis and comments made by Starbucks's management in their Form 10-K are referenced throughout this chapter.
- ▶ **Form 10-Q:** Companies file their quarterly reports with the SEC on Form 10-Q. This report presents important facts about interim financial performance.
- ▶ **Form 8-K:** The current report, which is filed on Form 8-K, must be submitted to the SEC within a few days of the date of certain significant events, such as the sale or purchase of a division or a change in auditors. The current report is often the first indicator of significant changes that will affect a company's financial performance in the future.

EXHIBIT 14-1 Selected Segment Information for Starbucks Corporation

	United States	International	Global CPG	Unallocated Corporate	Total
(Dollar amounts in millions)					
Fiscal 2008:					
Net Revenues:					
Company-operated retail	\$6,997.7	\$1,774.2	\$ —	\$ —	\$ 8,771.9
Specialty:					
Licensing	504.2	274.8	392.6	—	1,171.6
Foodservice and other	385.1	54.4	—	—	439.5
Total specialty	889.3	329.2	392.6	—	1,611.1
Total net revenues	7,887.0	2,103.4	392.6	—	10,383.0
Depreciation and amortization	401.7	108.8	—	38.8	549.3
Income (loss) from equity investees	(1.3)	54.2	60.7	—	113.6
Operating income/(loss)	528.1	110.0	205.3	(339.5)	503.9
Earnings/(loss) before income taxes	541.6	119.4	205.3	(406.8)	459.5
Equity method investments	(0.5)	223.6	44.8	—	267.9
Identifiable assets	2,362.9	1,272.7	116.0	1,921.0	5,672.6
Net impairment and disposition losses	275.1	19.0	—	30.9	325.0
Net capital expenditures	534.7	253.6	—	196.2	984.5
Fiscal 2007:					
Net Revenues:					
Company-operated retail	\$6,560.9	\$1,437.4	\$ —	\$ —	\$ 7,998.3
Specialty:					
Licensing	439.1	220.9	366.3	—	1,026.3
Foodservice and other	349.0	37.9	—	—	386.9
Total specialty	788.1	258.8	366.3	—	1,413.2
Total net revenues	7,349.0	1,696.2	366.3	—	9,411.5
Depreciation and amortization	348.2	84.2	—	34.7	467.1
Income from equity investees	0.8	45.7	61.5	—	108.0
Operating income/(loss)	1,070.5	137.7	183.6	(337.9)	1,053.9
Earnings/(loss) before income taxes	1,079.7	147.2	183.6	(354.2)	1,056.3
Equity method investments	0.8	196.9	36.8	—	234.5
Identifiable assets	2,454.6	1,116.1	91.6	1,681.6	5,343.9
Net impairment and disposition losses	9.3	15.1	—	1.6	26.0
Net capital expenditures	779.2	189.8	—	111.3	1,080.3

Source: Data from Starbucks Corporation, Form 10-K, 2008.

Business Periodicals and Credit and Investment Advisory Services

Financial analysts must keep up with current events in the financial world.

- ▶ **Newspapers and magazines:** A leading source of financial news is the *Wall Street Journal*. It is the most complete financial newspaper in the United States and is published every business day. Online subscriptions are also available. Useful print periodicals that are published every week or every two weeks include *Forbes*, *Barron's*, *Fortune*, and the *Financial Times*.

- ▶ **Credit and investment advisory services:** The publications of Moody's Investors Service and Standard & Poor's provide details about a company's financial history. Data on industry norms, average ratios, and credit ratings are available from agencies like Dun & Bradstreet. Dun & Bradstreet's *Industry Norms and Key Business Ratios* offers an annual analysis of 14 ratios for each of 125 industry groups, classified as retailing, wholesaling, manufacturing, and construction. *Annual Statement Studies*, published by Risk Management Association (formerly Robert Morris Associates), presents many facts and ratios for 223 different industries. The publications of a number of other agencies are also available for a yearly fee.

An example of specialized financial reporting readily available to the public is *Mergent's Dividend Achievers*. It profiles companies that have increased their dividends consistently over the past ten years. A listing from that publication—for **PepsiCo Inc.**—is presented in Exhibit 14-2. As you can see, a wealth of information about the company, including the market action of its stock, its business operations, recent developments and prospects, and earnings and dividend data, is summarized on one page. We use the kind of data contained in Mergent's summaries in many of the analyses and ratios that we present later in this chapter.

Executive Compensation

As we noted earlier in the text, one purpose of the Sarbanes-Oxley Act of 2002 was to strengthen the corporate governance of public corporations. Under this act, a public corporation's board of directors must establish a **compensation committee** made up of independent directors to determine how the company's top executives will be compensated. The company must disclose the components of compensation and the criteria it uses to remunerate top executives in documents that it files with the SEC.

The components of **Starbucks'** compensation of executive officers are typical of those used by many companies:

- ▶ Annual base salary
- ▶ Incentive bonuses
- ▶ Stock option awards⁵

Incentive bonuses and stock option awards are based on financial performance measures that the compensation committee identifies as important to the company's long-term success. Many companies tie incentive bonuses to measures like growth in revenues and return on assets or return on equity. Starbucks bases 80 percent of its incentive bonus on an "earnings per share target approved by the compensation committee" and 20 percent on the executive's "specific individual performance." The Financial Highlights at the beginning of the chapter show that Starbucks' earnings per share increased from 2005 to 2007, but decreased in 2008.

From one vantage point, earnings per share is a "bottom-line" number that encompasses all the other performance measures. However, using a single performance measure as the basis for determining compensation has the potential of leading to practices that are not in the best interests of the company or its stockholders. For instance, management could boost earnings per share by reducing the number of shares outstanding (the denominator in the earnings per share equation) while not improving earnings. It could accomplish this by using cash to repurchase shares of the company's stock (treasury stock), rather than investing the cash in more profitable operations.

EXHIBIT 14-2 Listing from Mergent's Dividend Achievers

PEPSICO INC.										
Exchange NYS	Symbol PEP	Price \$68.03 (8/31/2007)	52Wk Range 69.94-61.24	Yield 2.20	P/E 19.22					
*7 Year Price Score 89.69		*NYSE Composite Index=100		*12 Month Price Score 99.39		Interim Earnings (Per Share)				
						Qtr.	Mar	Jun	Aug	Dec
						2004	0.46	0.61	0.79	0.58
						2005	0.53	0.70	0.51	0.65
						2006	0.60	0.80	0.88	1.06
						2007	0.65	0.94
Interim Dividends (Per Share) Amt Decl Ex Rec Pay 0.30Q 11/17/2006 12/6/2006 12/8/2006 1/2/2007 0.30Q 2/2/2007 3/7/2007 3/9/2007 3/30/2007 0.375Q 5/2/2007 6/6/2007 6/8/2007 6/29/2007 0.375Q 7/19/2007 9/5/2007 9/7/2007 9/28/2007 Indicated Div: \$1.50 (Div. Reinv. Plan)						Valuation Analysis				
						Forecast P/E 15.48 (1/10/2007)				
						Market Cap \$110.3 Billion		Book Value 16.0 Billion		
						Price/Book 6.91		Price/Sales 3.03		
						Dividend Achiever Status				
						Total Years of Dividend Growth 35				
Business Summary: Food (MIC: 4.1 SIC: 2086 NAIC: 312111)										
PepsiCo is engaged in manufacturing, marketing and selling a range of salty, sweet and grain-based snacks, carbonated and non-carbonated beverages and foods. Co. is organized into four divisions: Frito-Lay North America (FLNA); PepsiCo Beverages North America (PBNA); PepsiCo International (PI); and Quaker Foods North America (QFNA). FLNA branded snacks include Lay's potato chips, Doritos tortilla chips and Rold Gold pretzels. PBNA's brands include Pepsi, Mountain Dew, Gatorade, Tropicana Pure Premium, and Lipton. PI's brands include Lay's, Walkers, Cheetos, Doritos, Ruffles, Gamesa and Sabritas. QFNA's brands include Quaker oatmeal, Rice-A-Roni and Near East side dishes.										
Recent Developments: For the quarter ended June 16 2007, net income increased 13.2% to US\$1.56 billion from US\$1.38 billion in the year-earlier quarter. Revenues were US\$9.61 billion, up 10.2% from US\$8.71 billion the year before. Operating income was US\$1.96 billion versus US\$1.80 billion in the prior-year quarter, an increase of 8.8%. Direct operating expenses rose 12.4% to US\$4.34 billion from US\$3.86 billion in the comparable period the year before. Indirect operating expenses increased 8.3% to US\$3.31 billion from US\$3.05 billion in the equivalent prior-year period.										
Prospects: Co. is seeing an increase in its net revenue, driven by robust snacks and beverage growth at its PepsiCo International division. Specifically, international snacks volume growth is being driven by double-digit growth in Russia and India, partially offset by low-single-digit declines at Sabritas in Mexico and Walkers in the U.K., while beverage volume growth is being fueled by double-digit growth in Pakistan, Russia, the Middle East and the U.K., partially offset by a mid-single-digit decline in Mexico and a double-digit decline in Thailand. Accordingly, Co. is raising its full year 2007 earnings guidance to at least \$3.35 per share.										
Financial Data										
(US\$ in Thousands)										
	6 Mos	3 Mos	12/30/2006	12/31/2005	12/25/2004	12/27/2003	12/28/2002	12/29/2001		
Earnings Per Share	3.54	3.40	3.34	2.39	2.44	2.05	1.85	1.47		
Cash Flow Per Share	3.86	3.95	3.70	3.45	2.99	2.53	2.65	2.39		
Tang Book Value Per Share	5.71	5.51	5.50	5.20	4.84	3.82	4.93	2.17		
Dividends Per Share	1.275	1.200	1.160	1.010	0.850	0.630	0.595	0.575		
Dividend Payout %	36.02	35.32	34.73	42.26	34.84	30.73	32.16	39.12		
Income Statement										
Total Revenue	16,957,000	7,350,000	35,137,000	32,562,000	29,261,000	26,971,000	25,112,000	26,935,000		
EBITDA	4,233,000	1,769,000	8,399,000	7,732,000	6,848,000	6,269,000	6,077,000	5,189,000		
Depn & Amortn	608,000	276,000	1,344,000	1,253,000	1,209,000	1,165,000	1,067,000	1,008,000		
Income Before Taxes	3,590,000	1,473,000	6,989,000	6,382,000	5,546,000	4,992,000	4,868,000	4,029,000		
Income Taxes	937,000	377,000	1,347,000	2,304,000	1,372,000	1,424,000	1,555,000	1,367,000		
Net Income	2,653,000	1,096,000	5,642,000	4,078,000	4,212,000	3,568,000	3,313,000	2,662,000		
Average Shares	1,665,000	1,673,000	1,687,000	1,706,000	1,729,000	1,739,000	1,789,000	1,807,000		
Balance Sheet										
Total Assets	31,925,000	29,830,000	29,930,000	31,727,000	27,987,000	25,327,000	23,474,000	21,695,000		
Current Liabilities	7,589,000	7,522,000	6,860,000	9,406,000	6,752,000	6,415,000	6,052,000	4,998,000		
Long-Term Obligations	3,261,000	1,807,000	2,550,000	2,313,000	2,397,000	1,702,000	2,187,000	2,651,000		
Total Liabilities	16,052,000	14,482,000	14,562,000	17,476,000	14,464,000	13,453,000	14,183,000	13,021,000		
Stockholders' Equity	15,956,000	15,429,000	15,447,000	14,320,000	13,572,000	11,896,000	9,298,000	8,648,000		
Shares Outstanding	1,621,000	1,631,000	1,638,000	1,656,000	1,679,000	1,705,000	1,722,000	1,756,000		
Statistical Record										
Return on Assets %	18.73	18.84	18.35	13.44	15.84	14.66	14.71	13.34		
Return on Equity %	37.96	37.90	38.01	28.77	33.17	33.76	37.02	33.58		
EBITDA Margin %	24.96	24.07	23.90	23.75	23.40	23.24	24.20	19.26		
Net Margin %	15.65	14.91	16.06	12.52	14.39	13.23	13.19	9.88		
Asset Turnover	1.15	1.16	1.14	1.07	1.10	1.11	1.11	1.35		
Current Ratio	1.29	1.16	1.33	1.11	1.28	1.08	1.06	1.17		
Debt to Equity	0.20	0.12	0.17	0.16	0.18	0.14	0.24	0.31		
Price Range	69.48-58.91	65.91-57.20	65.91-56.77	59.90-51.57	55.55-45.39	48.71-37.30	53.12-35.50	50.28-41.26		
P/E Ratio	19.63-16.64	19.39-16.82	19.73-17.00	25.06-21.58	22.77-18.60	23.76-18.20	28.71-19.19	34.20-28.07		
Average Yield %	1.99	1.93	1.90	1.82	1.66	1.43	1.29	1.25		
Address: 700 Anderson Hill Road, Purchase, NY 10577-1444			Officers: Steven S. Reinemund - Chmn., C.E.O. Indra K. Nooyi - Pres., C.F.O. Transfer Agents: The Bank of New York			Investor Contact: 914-253-3035 No of Institutions: 1292 Shares: 1,121,669,888 % Held: 68.49				
Telephone: 914-253-2000										
Web Site: www.pepsico.com										

Source: PepsiCo listing from *Mergent's Dividend Achievers Fall 2007: Featuring Second-Quarter Results for 2007*. Reprinted by permission of John Wiley & Sons Inc.

As you study the comprehensive financial analysis of Starbucks in the coming pages, consider that knowledge of performance measurement not only is important for evaluating a company but also leads to an understanding of the criteria by which a board of directors evaluates and compensates management.

STOP & APPLY >

Identify each of the following as (a) an objective of financial statement analysis, (b) a standard for financial statement analysis, (c) a source of information for financial statement analysis, or (d) an executive compensation issue:

- | | |
|-----------------------------------------------|-------------------------------|
| 1. A company's past performance | 5. Industry norms |
| 2. Investment advisory services | 6. Annual report |
| 3. Assessment of a company's future potential | 7. Creating shareholder value |
| 4. Incentive bonuses | 8. Form 10-K |

SOLUTION

1. b; 2. c; 3. a; 4. d; 5. b; 6. c; 7. d; 8. c

Tools and Techniques of Financial Analysis

L02 Apply horizontal analysis, trend analysis, vertical analysis, and ratio analysis to financial statements.

Study Note

It is important to ascertain the base amount used when a percentage describes an item. For example, inventory may be 50 percent of total current assets but only 10 percent of total assets.

To gain insight into a company's financial performance, one must look beyond the individual numbers to the relationship between the numbers and their change from one period to another. The tools of financial analysis—horizontal analysis, trend analysis, vertical analysis, and ratio analysis—are intended to show these relationships and changes. To illustrate how these tools are used, we devote the rest of this chapter to a comprehensive financial analysis of **Starbucks Corporation**.

Horizontal Analysis

Comparative financial statements provide financial information for the current year and the previous year. To gain insight into year-to-year changes, analysts use **horizontal analysis**, in which changes from the previous year to the current year are computed in both dollar amounts and percentages. The percentage change relates the size of the change to the size of the dollar amounts involved.

Exhibits 14-3 and 14-4 present **Starbucks Corporation's** comparative balance sheets and income statements and show both the dollar and percentage changes. The percentage change is computed as follows:

$$\text{Percentage Change} = 100 \times \left(\frac{\text{Amount of Change}}{\text{Base Year Amount}} \right)$$

The **base year** is always the first year to be considered in any set of data. For example, when comparing data for 2007 and 2008, 2007 is the base year. As the balance sheets in Exhibit 14-3 show, between 2007 and 2008, Starbucks' total current assets increased by \$51.5 million, from \$1,696.5 million to \$1,748.0 million, or by 3.0 percent. This is computed as follows:

$$\text{Percentage Change} = 100 \times \frac{\$51.5 \text{ million}}{\$1,696.5 \text{ million}} = 3.0\%$$

EXHIBIT 14-3 Comparative Balance Sheets with Horizontal Analysis

Starbucks Corporation
Consolidated Balance Sheets
September 28, 2008, and September 30, 2007

(Dollar amounts in millions)	2008	2007	Increase (Decrease)	
			Amount	Percentage
Assets				
Current assets:				
Cash and cash equivalents	\$ 269.8	\$ 281.3	\$ (11.5)	(4.1)
Short-term investments	52.5	157.4	(104.9)	(66.6)
Accounts receivable, net	329.5	287.9	41.6	14.4
Inventories	692.8	691.7	1.1	0.2
Prepaid and other current assets	169.2	148.8	20.4	13.7
Deferred income taxes, net	234.2	129.4	104.8	81.0
Total current assets	<u>\$1,748.0</u>	<u>\$1,696.5</u>	<u>\$ 51.5</u>	3.0
Long-term investments	374.0	279.9	94.1	33.6
Property, plant, and equipment, net	2,956.4	2,890.4	66.0	2.3
Other assets	261.1	219.4	41.7	19.0
Other intangible assets	66.6	42.1	24.5	58.2
Goodwill	266.5	215.6	50.9	23.6
Total assets	<u>\$5,672.6</u>	<u>\$5,343.9</u>	<u>\$328.7</u>	6.2
Liabilities and Shareholders' Equity				
Current liabilities:				
Commercial paper and short-term borrowings	\$ 713.0	\$ 710.3	\$ 2.7	0.4
Accounts payable	324.9	390.8	(65.9)	(16.9)
Accrued compensation and related costs	253.6	292.4	(38.8)	(13.3)
Accrued occupancy costs	136.1	74.6	61.5	82.4
Accrued taxes	76.1	92.5	(16.4)	(17.7)
Insurance reserves	152.5	137.0	15.5	11.3
Other accrued expenses	164.4	160.3	4.1	2.6
Deferred revenue	368.4	296.9	71.5	24.1
Current portion of long-term debt	0.7	0.8	(0.1)	(12.5)
Total current liabilities	<u>\$2,189.7</u>	<u>\$2,155.6</u>	<u>\$ 34.1</u>	1.6
Long-term debt and other liabilities	992.0	904.2	87.8	9.7
Shareholders' equity	2,490.9	2,284.1	206.8	9.1
Total liabilities and shareholders' equity	<u>\$5,672.6</u>	<u>\$5,343.9</u>	<u>\$328.7</u>	6.2

Source: Data from Starbucks Corporation, Form 10-K, 2008.

When examining such changes, it is important to consider the dollar amount of the change as well as the percentage change in each component. For example, the difference between the percentage increase in goodwill, 23.6 percent, and total current assets, 3.0 percent, is about 20 percent. However, the dollar increase in goodwill is similar to the dollar increase in current assets (\$50.9 million versus \$51.5 million).

Starbucks' balance sheets for this period, illustrated in Exhibit 14-3, also show an increase in total assets of \$328.7 million, or 6.2 percent. In addition,

EXHIBIT 14-4 Comparative Income Statements with Horizontal Analysis

Starbucks Corporation				
Consolidated Income Statements				
For the Years Ended September 28, 2008, and September 30, 2007				
(Dollar amounts in millions except per share amounts)	2008	2007	Increase (Decrease)	
			Amount	Percentage
Net revenues	\$10,383.0	\$9,411.5	\$ 971.5	10.3
Cost of sales, including occupancy costs	4,645.3	3,999.1	646.2	16.2
Gross margin	<u>\$ 5,737.7</u>	<u>\$5,412.4</u>	<u>\$ 325.3</u>	6.0
Operating expenses				
Store operating expenses	\$ 3,745.1	\$3,215.9	\$ 529.2	16.5
Other operating expenses	330.1	294.2	35.9	12.2
Depreciation and amortization expenses	549.3	467.2	82.1	17.6
General and administrative expenses	456.0	489.2	(33.2)	(6.8)
Restructuring charges	266.9	—	266.9	100.0
Total operating expenses	<u>\$ 5,347.4</u>	<u>\$4,466.5</u>	<u>\$ 880.9</u>	19.7
Operating income	\$ 390.3	\$ 945.9	\$(555.6)	(58.7)
Other income, net	122.6	148.4	(25.8)	(17.4)
Interest expense	(53.4)	(38.0)	(15.4)	40.5
Income before taxes	\$ 459.5	\$1,056.3	\$(596.8)	(56.5)
Provision for income taxes	144.0	383.7	(239.7)	(62.5)
Income before cumulative change for FIN 47, net of taxes	\$ 315.5	\$ 672.6	\$(357.1)	(53.1)
Cumulative effect of accounting change for FIN 47, net of taxes	—	—	—	0.0
Net income	<u>\$ 315.5</u>	<u>\$ 672.6</u>	<u>\$(357.1)</u>	(53.1)
Per common share:				
Net income per common share before cumulative effect of change in accounting principle—basic	\$ 0.43	\$ 0.90	\$ (0.47)	(52.2)
Cumulative effect of accounting change for FIN 47, net of taxes	—	—	—	0.0
Net income per common share—basic	<u>\$ 0.43</u>	<u>\$ 0.90</u>	<u>\$ (0.47)</u>	(52.2)
Net income per common share before cumulative effect of change in accounting principle—diluted	\$ 0.43	\$ 0.87	\$ (0.44)	(50.6)
Cumulative effect of accounting change for FIN 47, net of taxes	—	—	—	0.0
Net income per common share—diluted	<u>\$ 0.43</u>	<u>\$ 0.87</u>	<u>\$ (0.44)</u>	(50.6)
Shares used in calculation of net income per common share—basic	731.5	749.8	(18.3)	(2.4)
Shares used in calculation of net income per common share—diluted	741.7	770.1	(28.4)	(3.7)

Source: Data from Starbucks Corporation, Form 10-K, 2008.

they show that shareholders' equity increased by \$206.8 million, or 9.1 percent. All of this indicates that Starbucks is a growing company.

Starbucks' income statements in Exhibit 14-4 show that net revenues increased by \$971.5 million, or 10.3 percent, while gross margin increased by \$325.3 million, or 6.0 percent. This indicates that cost of sales grew faster than net revenues. Starbucks' total operating expenses increased by \$880.9 million, or 19.7 percent, much faster than the 10.3 percent increase in net revenues. As a result, operating income declined by \$555.6 million, or 58.7 percent, and net income decreased by \$357.1 million, or 53.1 percent. In management's words,

Approximately 260 basis points of the decrease in operating margin was a result of restructuring charges, primarily related to the significant U.S. store closures. Softness in U.S. revenues along with higher cost of sales including occupancy costs and store operating expenses were also significant drivers in the margin decline.⁶

Trend Analysis

Study Note

To reflect the general five-year economic cycle of the U.S. economy, trend analysis usually covers a five-year period. Starbucks analysis shows six years due to the economic downturn in 2008. Cycles of other lengths exist and are tracked by the National Bureau of Economic Research. Trend analysis needs to be of sufficient length to show a company's performance in both up and down markets.

Trend analysis is a variation of horizontal analysis. With this tool, the managers and analysts calculate percentage changes for several successive years instead of for just two years. Because of its long-term view, trend analysis can highlight basic changes in the nature of a business.

In addition to presenting comparative financial statements, many companies present a summary of key data for five or more years. Exhibit 14-5 shows a trend analysis of **Starbucks'** six-year summary of net revenues and operating income.

Trend analysis uses an **index number** to show changes in related items over time. For an index number, the base year is set at 100 percent. Other years are measured in relation to that amount. For example, the 2007 index for Starbucks' net revenues is figured as follows (dollar amounts are in millions):

$$\begin{aligned} \text{Index} &= 100 \times \left(\frac{\text{Index Year Amount}}{\text{Base Year Amount}} \right) \\ &= 100 \times \left(\frac{\$9,411.5}{\$4,075.5} \right) = 230.9\% \end{aligned}$$

EXHIBIT 14-5
Trend Analysis

Starbucks Corporation						
Net Revenues and Operating Income						
Trend Analysis						
	2008	2007	2006	2005	2004	2003
Dollar values						
(In millions)						
Net revenues	\$10,383.0	\$9,411.5	\$7,786.9	\$6,369.3	\$5,294.2	\$4,075.5
Operating income	390.3	945.9	800.0	703.9	549.5	386.3
Trend analysis						
(In percentages)						
Net revenues	254.8	230.9	191.1	156.3	129.9	100.0
Operating income	101.0	244.9	207.1	182.2	142.2	100.0

Source: Data from Starbucks Corporation, Form 10-K, 2008 and Form 10-K, 2007.

The trend analysis in Exhibit 14-5 shows that Starbucks' net revenues increased over the six-year period. Operating income grew faster than net revenues in every year except 2008 when it fell to 2003 levels.

In the words of Starbucks' management,

We have just completed a very difficult fiscal 2008, and after 16 years of continuous growth as a public company, we were for the first time talking about slowing growth, store closures and cost reductions.⁷

Vertical Analysis

Vertical analysis shows how the different components of a financial statement relate to a total figure in the statement. The manager or analyst sets the total figure at 100 percent and computes each component's percentage of that total. The resulting financial statement, which is expressed entirely in percentages, is called a **common-size statement**. Vertical analysis and common-size statements are useful in comparing the importance of specific components in the operation of a business and in identifying important changes in the components from one year to the next.

Common-size balance sheets and common-size income statements for **Starbucks Corporation** are shown in financial statement form in Exhibits 14-6 and 14-7. (On the balance sheet, the total figure is total assets or total liabilities and stockholders' equity, and on the income statement, it is net revenues.) The main conclusions to be drawn from this analysis of Starbucks are that the company's assets consist largely of current assets and property, plant, and equipment and that the company finances assets primarily through current liabilities and a growing amount of long-term liabilities.

Looking at the common-size balance sheets in Exhibit 14-6, you can see that the composition of Starbucks' assets moved from current assets to long-term investments and goodwill. You can also see that the relationship of liabilities and

EXHIBIT 14-6
Common-Size Balance Sheets

Starbucks Corporation			
Common-Size Balance Sheets			
September 28, 2008, and September 30, 2007, and October 1, 2006			
	2008	2007	2006
Assets			
Current assets	30.8%	31.7%	34.5%
Property, plant, and equipment, net	52.1	54.1	51.7
Long-term investments	6.6	5.2	5.1
Other assets	4.6	4.1	4.2
Goodwill	4.7	4.0	3.6
Other intangible assets	1.2	0.8	0.9
Total assets	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>
Liabilities and Shareholders' Equity			
Current liabilities	38.6	40.3%	43.7%
Long-term debt and other liabilities	17.5	16.9	6.0
Shareholders' equity	43.9	42.7	50.3
Total liabilities and shareholders' equity	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

Note: Amounts do not precisely total 100 percent in all cases due to rounding.
Source: Data from Starbucks Corporation, Form 10-K, 2008 and Form 10-K, 2007.
Note: Not all items are presented.

EXHIBIT 14-7

Common-Size Income Statements

Starbucks Corporation
Common-Size Income Statements
For the Years Ended September 28, 2008 and September 30, 2007,
and October 1, 2006

	2008	2007	2006
Net revenues	100.0%	100.0%	100.0%
Cost of sales, including occupancy costs	<u>44.7</u>	<u>42.5</u>	<u>40.8</u>
Gross margin	<u>55.3%</u>	<u>57.5%</u>	<u>59.2%</u>
Operating expenses:			
Store operating expenses	36.1%	34.2%	34.5%
Other operating expenses	3.2	3.1	3.3
Depreciation and amortization expenses	5.3	5.0	5.0
General and administrative expenses	4.4	5.2	6.2
Restructuring charges	<u>2.5</u>	<u>—</u>	<u>—</u>
Total operating expenses	<u>51.5%</u>	<u>47.5%</u>	<u>48.9%</u>
Operating income	3.8%	10.1%	10.3%
Other income, net	<u>0.6</u>	<u>1.2</u>	<u>1.4</u>
Income before taxes	4.4%	11.2%	11.6%
Provision for income taxes	1.4	4.1	4.2
Income before cumulative change for FIN 47, net of taxes	<u>3.0%</u>	<u>7.1%</u>	<u>7.5%</u>
Cumulative effect of accounting change for FIN 47, net of taxes	<u>—</u>	<u>—</u>	<u>(0.2)</u>
Net income	<u>3.0%</u>	<u>7.1%</u>	<u>7.2%</u>

Note: Amounts do not precisely total 100 percent in all cases due to rounding.

Source: Data from Starbucks Corporation, Form 10-K, 2008 and Form 10-K, 2007.

equity moved from stockholders' equity and current liabilities to long-term debt and other liabilities. The common-size income statements in Exhibit 14-7 show that Starbucks continues to reduce its general and administrative expenses from 2006 to 2008 while store operating expenses continue to increase. In management's words,

Starbucks business is highly sensitive to increases and decreases in customer traffic. Increased customer visits create sales leverage, meaning that fixed expenses, such as occupancy costs, are spread across a greater revenue base, thereby improving operating margins. But the reverse is also true—sales de-leveraging creates downward pressure on margins. The softness in U.S. revenues during fiscal 2008 impacted nearly all consolidated and U.S. segment operating expense line items when viewed as a percentage of sales.⁸

Common-size statements are often used to make comparisons between companies. They allow managers and analysts to compare the operating and financing characteristics of two companies of different size in the same industry. For example, a Starbucks manager might want to compare Starbucks with other specialty coffee retailers like **Caribou Coffee** in terms of percentage of total assets financed by debt or in terms of operating expenses as a percentage of net revenues. Common-size statements would show those and other relationships. These statements can also be used to compare the characteristics of companies that report in different currencies.

Ratio Analysis

Ratio analysis identifies key relationships between the components of the financial statements. Ratios are useful tools for evaluating a company's financial position and operations and may reveal areas that need further investigation. To interpret ratios correctly, one must have a general understanding of the company and its environment, financial data for several years or for several companies, and an understanding of the data underlying the numerator and denominator.

Ratios can be expressed in several ways. For example, a ratio of net income of \$100,000 to sales of \$1,000,000 can be stated as follows:

1. Net income is 1/10, or 10 percent, of sales.
2. The ratio of sales to net income is 10 to 1 (10:1), or sales are 10 times net income.
3. For every dollar of sales, the company has an average net income of 10 cents.

STOP & APPLY >

Using 2007 as the base year, prepare a trend analysis of the following data for Sample Company, and tell whether the situation shown by the trends is favorable or unfavorable. (Round your answers to one decimal place.)

	2011	2010	2009	2008	2007
Net sales	\$1,520	\$980	\$1,200	\$880	\$1,000
Cost of goods sold	620	600	540	700	600
General and administrative expenses	290	184	188	160	180
Operating income	610	196	472	20	220

Compute the amount and percentage changes for the following balance sheets for Sample Company, and comment on the changes from 2010 to 2011. (Round the percentage changes to one decimal place.)

Sample Company Comparative Balance Sheets December 31, 2011 and 2010

	2011	2010
Assets		
Current assets	\$ 600	\$ 800
Property, plant, and equipment (net)	10,500	7,200
Total assets	<u>\$11,100</u>	<u>\$8,000</u>
Liabilities and Stockholders' Equity		
Current liabilities	\$ 1,200	\$ 900
Long-term liabilities	5,000	3,000
Stockholders' equity	4,900	4,100
Total liabilities and stockholders' equity	<u>\$11,100</u>	<u>\$8,000</u>

(continued)

Express the partial comparative income statements for Sample Company that follow as common-size statements, and comment on the changes from 2010 to 2011. (Round computations to one decimal place.)

Sample Company
Partial Comparative Income Statements
For the Years Ended December 31, 2011 and 2010

	2011	2010
Net sales	\$12,000	\$10,000
Cost of goods sold	<u>7,200</u>	<u>6,000</u>
Gross margin	\$ 4,800	\$ 4,000
Selling and general expenses	<u>4,000</u>	<u>3,800</u>
Operating income	<u>\$ 800</u>	<u>\$ 200</u>

SOLUTION

Trend Analysis Solution	2011	2010	2009	2008	2007
Net sales	152.0%	98.0%	120.0%	88.0%	100.0%
Cost of goods sold	103.3	100.0	90.0	116.7	100.0
General and administrative expenses	161.1	102.2	104.4	88.9	100.0
Operating income	277.3	89.1	214.5	9.1	100.0

Comment: No clear trends are apparent, as sales, expenses, and operating income fluctuated year to year.

Horizontal Analysis Solution

Sample Company
Comparative Balance Sheets
December 31, 2011 and 2010

	2011	2010	Increase (Decrease)	
			Amount	Percentage
Assets				
Current assets	\$ 600	\$ 800	\$(200)	25.0%
Property, plant, and equipment (net)	<u>10,500</u>	<u>7,200</u>	<u>3,300</u>	<u>45.8</u>
Total assets	<u>\$11,100</u>	<u>\$8,000</u>	<u>\$3,100</u>	<u>38.8%</u>
Liabilities and Stockholders' Equity				
Current liabilities	\$ 1,200	\$ 900	\$ 300	33.3%
Long-term liabilities	5,000	3,000	2,000	66.7
Stockholders' equity	4,900	4,100	800	19.5
Total liabilities and stockholders' equity	<u>\$11,100</u>	<u>\$8,000</u>	<u>\$3,100</u>	<u>38.8%</u>

Comment: All categories increased except for current assets. The largest increase was in long-term liabilities.

Vertical Analysis Solution

Sample Company
Partial Comparative Income Statements
For the Years Ended December 31, 2011 and 2010

	2011	2010
Net sales	100.0%	100.0%
Cost of goods sold	<u>60.0</u>	<u>60.0</u>
Gross margin	40.0%	40.0%
Selling and general expenses	<u>33.3</u>	<u>38.0</u>
Operating income	<u>6.7%</u>	<u>2.0%</u>

Comment: Operating income increased because expenses decreased as a percentage of sales.

Comprehensive Illustration of Ratio Analysis

LO3 Apply ratio analysis to financial statements in a comprehensive evaluation of a company's financial performance.

In this section, to illustrate how managers and analysts use ratio analysis in evaluating a company's financial performance, we perform a comprehensive ratio analysis of **Starbucks'** performance in 2006, 2007, and 2008. Compare the following excerpt from the discussion and analysis section of Starbucks' 2007 annual report with what you have already learned from manager analyses of the 2008 performance. These manager insights provide the context for our evaluation of the company's liquidity, profitability, long-term solvency, cash flow adequacy, and market strength:

Starbucks achieved solid performance in fiscal 2007—meeting its targets for store openings, revenue growth, comparable store sales growth, and earnings per share—despite a challenging economic and operating environment, and significant cost increases from dairy. The Company completed the fiscal year with encouraging trends and momentum in its International business but faced increasing challenges in its U.S. business. While U.S. comparable store sales were within the Company's stated target range, it was accomplished through two price increases which offset flat-to-negative transaction count trends in the U.S. business. The pressure on traffic is consistent with similar trends reported across both the retail and restaurant industry. Management believes that the combination of the economic slowdown and the price increases implemented in fiscal 2007 to help mitigate significant cost pressures have impacted the frequency of customer visits to Starbucks stores.

Evaluating Liquidity

As you know, liquidity is a company's ability to pay bills when they are due and to meet unexpected needs for cash. Because debts are paid out of working capital, all liquidity ratios involve working capital or some part of it. (Cash flow ratios are also closely related to liquidity.)

Exhibit 14-8 presents **Starbucks'** liquidity ratios in 2006, 2007, and 2008. The **current ratio** and the **quick ratio** are measures of short-term debt-paying ability. The principal difference between the two ratios is that the numerator of the current ratio includes inventories and prepaid expenses. Inventories take longer to convert to cash than the quick assets included in the numerator of the quick ratio. Starbucks' current ratio remained stable at 0.8 during 2006–2008. Its quick ratio was 0.4 in 2006 and remained stable at 0.3 during 2007 and 2008. These ratios indicate consistent cash management policies by Starbucks.

The **receivable turnover** measures the relative size of accounts receivable and the effectiveness of credit policies. The related ratio of **days' sales uncollected** expresses the average number of days between sales on account and the account payment. Starbucks' receivables appear to be slowing. The receivable turnover continues its trend downward from 37.5 times in 2006 to 36.7 times in 2007 to 33.6 times in 2008. Or, as expressed in days' sales uncollected, it is taking a day longer to collect from customers since 2006. The number of days is quite low because the majority of Starbucks' revenues are from cash sales.

The **inventory turnover** measures the relative size of inventories and generally how many times per year the inventory is restocked. The related ratio of **days' inventory on hand** expresses in general terms how long inventory generally stays on the shelf before it is sold. Starbucks' inventory turnover increased from 5.4 times in 2006 to 6.0 times in 2007 to 6.7 times in 2008. This resulted in a favorable decrease in days' inventory on hand, from 67.6 days in 2006 to 60.8 days in 2007 to 54.5 days in 2008.

The **operating cycle** is the time it takes to acquire and sell products and then to collect for them. It is computed by adding the days' sales uncollected to the

Study Note

When examining ratios in published sources, be aware that publishers often redefine the content of the ratios provided by the companies. While the general content is similar, variations occur. Be sure to ascertain and evaluate the information that a published source uses to calculate ratios.

EXHIBIT 14-8 Liquidity Ratios of Starbucks Corporation (Dollar amounts in millions)

	2008	2007	2006
Current ratio: Measure of short-term debt-paying ability			
$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	$\frac{\$1,748.0}{\$2,189.7} = 0.8 \text{ times}$	$\frac{\$1,696.5}{\$2,155.6} = 0.8 \text{ times}$	$\frac{\$1,529.8}{\$1,935.6} = 0.8 \text{ times}$
Quick ratio: Measure of short-term debt-paying ability			
$\frac{\text{Cash} + \text{Marketable Securities} + \text{Receivables}}{\text{Current Liabilities}}$	$\frac{\$269.8 + \$52.5 + \$329.5}{\$2,189.7} = 0.3 \text{ times}$	$\frac{\$281.3 + \$157.4 + \$287.9}{\$2,155.6} = 0.3 \text{ times}$	$\frac{\$312.6 + \$141.0 + \$224.3}{\$1,935.6} = 0.4 \text{ times}$
Receivable turnover: Measure of relative size of accounts receivable and effectiveness of credit policies			
$\frac{\text{Net Sales}}{\text{Average Accounts Receivable}}$	$\frac{\$10,383.0}{(\$329.5 + \$287.9) \div 2} = 33.6 \text{ times}$	$\frac{\$9,411.5}{(\$287.9 + \$224.3) \div 2} = 36.7 \text{ times}$	$\frac{\$7,786.9}{(\$224.3 + \$190.8^*) \div 2} = 37.5 \text{ times}$
Days' sales uncollected: Measure of average days taken to collect receivables			
$\frac{\text{Days in Year}}{\text{Receivable Turnover}}$	$\frac{365 \text{ days}}{33.6 \text{ times}} = 10.9 \text{ days}$	$\frac{365 \text{ days}}{36.7 \text{ times}} = 9.9 \text{ days}$	$\frac{365 \text{ days}}{37.5 \text{ times}} = 9.7 \text{ days}$
Inventory turnover: Measure of relative size of inventory			
$\frac{\text{Costs of Goods Sold}}{\text{Average Inventory}}$	$\frac{\$4,645.3}{(\$692.8 + \$691.7) \div 2} = 6.7 \text{ times}$	$\frac{\$3,999.1}{(\$691.7 + \$636.2) \div 2} = 6.0 \text{ times}$	$\frac{\$3,178.8}{(\$636.2 + \$546.3^*) \div 2} = 5.4 \text{ times}$
Days' inventory on hand: Measure of average days taken to sell inventory			
$\frac{\text{Days in Year}}{\text{Inventory Turnover}}$	$\frac{365 \text{ days}}{6.7 \text{ times}} = 54.5 \text{ days}$	$\frac{365 \text{ days}}{6.0 \text{ times}} = 60.8 \text{ days}$	$\frac{365 \text{ days}}{5.4 \text{ times}} = 67.6 \text{ days}$
Payables turnover: Measure of relative size of accounts payable			
$\frac{\text{Costs of Goods Sold} + / - \text{Change in Inventory}}{\text{Average Accounts Payable}}$	$\frac{\$4,645.3 + \$1.1}{(\$324.9 + \$390.8) \div 2} = 13.0 \text{ times}$	$\frac{\$3,999.1 + \$55.4}{(\$390.8 + \$340.9) \div 2} = 11.1 \text{ times}$	$\frac{\$3,178.8 + \$89.9^*}{(\$340.9 + \$221.0) \div 2} = 11.6 \text{ times}$
Days' payable: Measure of average days taken to pay accounts payable			
$\frac{\text{Days in Year}}{\text{Payables Turnover}}$	$\frac{365 \text{ days}}{13.0 \text{ times}} = 28.1 \text{ days}$	$\frac{365 \text{ days}}{11.1 \text{ times}} = 32.9 \text{ days}$	$\frac{365 \text{ days}}{11.6 \text{ times}} = 31.5 \text{ days}$

*Figures for 2005 are from the balance sheet in Starbucks' Form 10-K, 2006.

Source: Data from Starbucks Corporation, Form 10-K, 2008, Form 10-K, 2007, and Form 10-K, 2006.

days' inventory on hand. Starbucks' operating cycle continues its positive trend primarily because of improving inventory management. It has decreased from 77.3 days in 2006 (9.7 days + 67.6 days) to 70.7 days in 2007 (9.9 days + 60.8 days) to 65.3 days (10.9 days + 54.5 days) in 2008.

Related to the operating cycle is the **payables turnover**, which is the number of days a company takes to pay its accounts payable. The related ratio of **days' payable** expresses the average number of days it takes a company to pay its bills. Starbucks' payables turnover varied from 11.6 times in 2006 to 11.1 times in 2007 to 13.0 times, or, stated in terms of days' payable, it took about 31.5 days in 2006, 32.9 days in 2007, and 28.1 days in 2008 for Starbucks to pay its accounts payables.

If the days' payable is subtracted from the operating cycle, you can determine a company's financing period—the number of days that financing is required. Starbucks' financing period continues to shrink from 45.8 days in 2006 (77.3 days – 31.5 days) to 37.8 days in 2007 (70.7 days – 32.9 days) to 37.2 days (65.3 days – 28.1 days) in 2008. Overall, the company's liquidity improved.

Evaluating Profitability

Study Note

In accounting literature, profit is expressed in different ways—for example, as income before income taxes, income after income taxes, or operating income. To draw appropriate conclusions from profitability ratios, you must be aware of the content of net income data.

Managers, investors, and creditors are interested in evaluating not only a company's liquidity but also its profitability—that is, its ability to earn a satisfactory income. Profitability is closely linked to liquidity because earnings ultimately produce the cash flow needed for liquidity. Exhibit 14-9 shows **Starbucks'** profitability ratios in 2006, 2007, and 2008.

Profit margin focuses on income statement results and measures how well a company manages its costs per dollar of sales. **Asset turnover** focuses on how efficiently balance sheet assets are used to produce sales. **Return on assets** combines these two ratios to measure the earning power of a business. Starbucks' profit margin decreased from 7.2 to 7.1 to 3.0 percent between 2006 and 2008. Its asset turnover remained relatively stable at 2.0 times in 2006 and 1.9 times

EXHIBIT 14-9 Profitability Ratios of Starbucks Corporation (Dollar amounts in millions)

	2008	2007	2006
Profit margin: Measure of net income produced by each dollar of sales			
$\frac{\text{Net Income}}{\text{Net Sales}}$	$\frac{\$315.5}{\$10,383.0} = 3.0\%$	$\frac{\$672.6}{\$9,411.5} = 7.1\%$	$\frac{\$564.3}{\$7,786.9} = 7.2\%$
Asset turnover: Measure of how efficiently assets are used to produce sales			
$\frac{\text{Net Sales}}{\text{Average Total Assets}}$	$\frac{\$10,383.0}{(\$5,672.6 + \$5,343.9) \div 2} = 1.9 \text{ times}$	$\frac{\$9,411.5}{(\$5,343.9 + \$4,428.9) \div 2} = 1.9 \text{ times}$	$\frac{\$7,786.9}{(\$4,428.9 + \$3,513.7^*) \div 2} = 2.0 \text{ times}$
Return on assets: Measure of overall earning power or profitability			
$\frac{\text{Net Income}}{\text{Average Total Assets}}$	$\frac{\$315.5}{\$5,508.3} = 5.7\%$	$\frac{\$672.6}{\$4,886.4} = 13.8\%$	$\frac{\$564.3}{\$3,971.3} = 14.2\%$
Return on equity: Measure of the profitability of stockholders' investments			
$\frac{\text{Net Income}}{\text{Average Stockholders' Equity}}$	$\frac{\$315.5}{(\$2,490.9 + \$2,284.1) \div 2} = 13.2\%$	$\frac{\$672.6}{(\$2,284.1 + \$2,228.5) \div 2} = 29.8\%$	$\frac{\$564.3}{(\$2,228.5 + \$2,090.3) \div 2} = 26.1\%$

*Figures for 2005 are from the five-year selected financial data in Starbucks' Form 10-K, 2006.

Source: Data from Starbucks Corporation, Form 10-K, 2008, Form 10-K, 2007, and Form 10-K, 2006.

in 2007 and 2008. The result is a decrease in the company's earning power, or return on assets, from 14.2 percent in 2006 to 13.8 percent in 2007 to 5.7 percent in 2008. The computations that follow show the relationship among these three profitability ratios.

<i>Profit Margin</i>			<i>Asset Turnover</i>		<i>Return on Assets*</i>
$\frac{\text{Net Income}}{\text{Net Sales}}$	×		$\frac{\text{Net Sales}}{\text{Average Total Assets}}$	=	$\frac{\text{Net Income}}{\text{Average Total Assets}}$
2006 7.2%	×		2.0 times	=	14.4%
2007 7.1	×		1.9	=	13.5
2008 3.0	×		1.9	=	5.7

Study Note

The analysis of both asset turnover and return on assets is improved if only productive assets are used in the calculations. For example, when investments in unfinished new plant construction or in plants that are now obsolete or nonoperating are removed from the asset base, the result is a better picture of the productivity of assets.

Return on equity measures the earning power of a company's stockholders investment. Starbucks' return on equity had mixed results for its shareholders of 26.1 percent in 2006 to 29.8 percent in 2007 to 13.2 percent in 2008.

A word of caution: Although we have used net income in computing profitability ratios for Starbucks, net income is not always a good indicator of a company's sustainable earnings. For instance, if a company has discontinued operations, income from continuing operations may be a better measure of sustainable earnings. For a company that has one-time items on its income statement—such as restructurings, gains, or losses—income from operations before these items may be a better measure. Some managers and analysts like to use earnings before interest and taxes, or EBIT, for the earnings measure because it excludes the effects of the company's borrowings and the tax rates from the analysis. Whatever figure one uses for earnings, it is important to try to determine the effects of various components on future operations.

Evaluating Long-Term Solvency

Long-term solvency has to do with a company's ability to survive for many years. The aim of evaluating long-term solvency is to detect early signs that a company is headed for financial difficulty. Increasing amounts of debt in a company's capital structure mean that the company is becoming more heavily leveraged. This condition may have a negative effect on long-term solvency because it represents increasing legal obligations to pay interest periodically and the principal at maturity. Failure to make those payments can result in bankruptcy. Alternatively, if interest rates are low, many companies will elect to borrow to finance operations to grow business and earn a healthy return, but only if they can earn a return on assets greater than the cost of interest.

Declining profitability and liquidity ratios are key indicators of possible failure. Two other ratios that analysts consider when assessing long-term solvency are debt to equity and interest coverage, which are shown in Exhibit 14-10. The **debt to equity ratio** measures capital structure and leverage by showing the amount of a company's assets provided by creditors in relation to the amount provided by stockholders. Starbucks' debt to equity ratio increased from .99 times in 2006 to 1.3 times in 2007 and 2008, representing an increased reliance on debt financing. Recall from Exhibit 14-6 that Starbucks' long-term debt and other liabilities more than doubled. However, the company has little short-term debt and a strong current ratio. Starbucks' long-term solvency is not in danger.

If debt is risky, why have any? The answer is that the level of debt is a matter of balance. Despite its riskiness, debt is a flexible means of financing certain

Study Note

Liquidity is a firm's ability to meet its current obligations; solvency is its ability to meet maturing obligations as they come due without losing the ability to continue operations.

*The small difference in the computations of return on assets in Exhibit 14-9 and the computations below results from the rounding of the ratios.



FOCUS ON BUSINESS PRACTICE

What's the Best Way to Measure Performance for Management Compensation?

Efforts to link management compensation to performance measures and the creation of shareholder wealth are increasing. **Starbucks** uses earning per share (EPS) for this purpose. Some other companies, including **Walgreens**, use a better approach. Walgreens' use of return on invested capital, which is closely related to return on assets, shows whether or not management is employing the assets

profitably. Better still would be to compare the company's return on assets to its cost of debt and equity capital, as does **Target**.⁹ Many analysts believe that this measure, which is called economic value added (EVA), is superior to EPS. If the return on assets exceeds the cost of financing the assets with debt and equity, then management is indeed creating value for the shareholders.

business operations. The interest paid on debt is tax-deductible, whereas dividends on stock are not. Because debt usually carries a fixed interest charge, the cost of financing can be limited, and leverage can be used to advantage. If a company can earn a return on assets greater than the cost of interest, it makes an overall profit. In addition, being a debtor in periods of inflation has advantages because the debt, which is a fixed dollar amount, can be repaid with cheaper dollars. However, the company runs the risk of not earning a return on assets equal to the cost of financing the assets, thereby incurring a loss.

The **interest coverage ratio** measures the degree of protection creditors have from default on interest payments. As shown in Exhibit 14-10, Starbucks' interest coverage declined from 108.9 times in 2006 to 28.8 in 2007 to 9.6 in 2008 due to large increases in interest. Interest coverage is still at a safe level but deteriorating rapidly.

Study Note

Because of innovative financing plans and other means of acquiring assets, lease payments and similar types of fixed obligations should be considered when evaluating long-term solvency.

Evaluating the Adequacy of Cash Flows

Because cash flows are needed to pay debts when they are due, cash flow measures are closely related to liquidity and long-term solvency. Exhibit 14-11 presents **Starbucks**' cash flow adequacy ratios in 2006, 2007, and 2008. **Cash flow yield** shows the cash-generating ability of a company's operations; it is measured by dividing cash flows from operating activities by net income. Starbucks' net cash flows from operating activities went from \$1,1316.6 million in 2006 to \$1,331.2 million in 2007 to \$1,258.7 million in 2008. Its cash flow yield was stable at 2.0 times in 2006 and 2007 but rose to 4.0 times in 2008.

EXHIBIT 14-10 Long-term Solvency Ratios of Starbucks Corporation (Dollar amounts in millions)

	2008	2007	2006
Debt to equity ratio: Measure of capital structure and leverage			
$\frac{\text{Total Liabilities}}{\text{Stockholders' Equity}}$	$\frac{\$3,181.7}{\$2,490.9} = 1.3 \text{ times}$	$\frac{\$3,059.8}{\$2,284.1} = 1.3 \text{ times}$	$\frac{\$2,200.4}{\$2,228.5} = .99 \text{ times}$
Interest coverage ratio: Measure of creditors' protection from default on interest payments			
$\frac{\text{Income Before Income Taxes} + \text{Interest Expense}}{\text{Interest Expense}}$	$\frac{\$459.5 + \$53.4}{\$53.5} = 9.6 \text{ times}$	$\frac{\$1,056.3 + \$38.0}{\$38.0} = 28.8 \text{ times}$	$\frac{\$906.3 + \$8.4}{\$8.4} = 108.9 \text{ times}$

Source: Starbucks Corporation, Form 10-K, 2008 and Form 10-K, 2007.

EXHIBIT 14-11 Cash Flow Adequacy Ratios of Starbucks Corporation (Dollar amounts in millions)

	2008	2007	2006
Cash flow yield: Measure of the ability to generate operating cash flows in relation to net income			
Net Cash Flows from Operating Activities	\$1,258.7	\$1,331.2	\$1,131.6
Net Income	\$315.5	\$672.6	\$564.3
	$\frac{1,258.7}{315.5} = 4.0$ times	$\frac{1,331.2}{672.6} = 2.0$ times	$\frac{1,131.6}{564.3} = 2.0$ times
Cash flows to sales: Measure of the ability of sales to generate operating cash flows			
Net Cash Flows from Operating Activities	\$1,258.7	\$1,331.2	\$1,131.6
Net Sales	\$10,383.0	\$9,411.5	\$7,786.9
	$\frac{1,258.7}{10,383.0} = 12.1\%$	$\frac{1,331.2}{9,411.5} = 14.1\%$	$\frac{1,131.6}{7,786.9} = 14.5\%$
Cash flows to assets: Measure of the ability of assets to generate operating cash flows			
Net Cash Flows from Operating Activities	\$1,258.7	\$1,331.2	\$1,131.6
Average Total Assets	$(\$5,672.6 + \$5,343.9) \div 2$	$(\$5,343.9 + \$4,428.9) \div 2$	$(\$4,428.9 + \$3,513.7^*) \div 2$
	$\frac{1,258.7}{5,508.3} = 22.9\%$	$\frac{1,331.2}{4,886.4} = 27.2\%$	$\frac{1,131.6}{3,971.3} = 28.5\%$
Free cash flow: Measure of cash remaining after providing for commitments			
Net Cash Flows from Operating Activities	\$1,258.7	\$1,331.2	\$1,131.6*
– Dividends	– \$0	– \$0	– \$0
– Net Capital Expenditures**	– \$984.5	– \$1,080.3	– \$771.2
	= \$274.2	= \$250.9	= \$360.4

*The 2005 figure is from the five-year selected financial data in Starbucks' Form 10-K, 2006.

**Net capital expenditures are called "net additions to property, plant and equipment" on Starbucks' statements of cash flows.

Source: Data from Starbucks Corporation, Form 10-K, 2008, Form 10-K, 2007, and Form 10-K, 2006.

The largest contributor to net cash flow from operating activities is depreciation expense. In 2008, \$604.5 million in depreciation was added back. This is almost half of Starbucks' 2008 net cash flows from operating activities.

Cash flows to sales and **cash flows to assets** measure the ability of sales or assets to generate operating cash flow. Cash flows to sales continue to trend downward from 14.5 to 14.1 to 12.1 percent from 2006 to 2008. Cash flows to assets also continue to decrease from 28.5 to 27.2 to 22.9 percent over the three-year period. This means the company's net sales and average total assets increased faster than the cash flows provided by its operations.

Free cash flow is the cash remaining after providing for commitments such as dividends and net capital expenditures. As shown in Exhibit 14-11, free cash flow for Starbucks appears to be on the rebound to \$274.2 million in 2008 after declining from \$360.4 million in 2006 to \$250.9 million in 2007. One factor is reduced spending on net capital expenditures (the difference between purchases and sales of plant assets).

Another factor in Starbucks' free cash flows is that the company pays no dividends. In top management's words regarding future liquidity and cash flows: "We generate strong cash flows and have solid liquidity, and we are executing rigorous cost-containment initiatives to improve our bottom line."¹⁰

Study Note

When the computation for free cash flow uses "net capital expenditures" in place of "purchases of plant assets minus sales of plant assets," it means that the company's sales of plant assets were too small or immaterial to be broken out.

EXHIBIT 14-12 Market Strength Ratios of Starbucks Corporation

	2008	2007	2006
Price/earnings (P/E) ratio: Measure of investors' confidence in a company			
$\frac{\text{Market Price per Share}}{\text{Earnings per Share}}$	$\frac{\$15.25^*}{\$0.43} = 35.5 \text{ times}$	$\frac{\$27.08^*}{\$0.90} = 30.1 \text{ times}$	$\frac{\$33.78^*}{\$0.74} = 45.6 \text{ times}$
Dividends yield: Measure of a stock's current return to an investor			
$\frac{\text{Dividends per Share}}{\text{Market Price per Share}}$	Starbucks does not pay a dividend.		

*Market price is the average for the fourth quarter reported in Starbucks' annual report.

Source: Data from Starbucks Corporation, Form 10-K, 2008, and Form 10-K 2007.

Evaluating Market Strength

Market price is the price at which a company's stock is bought and sold. It indicates how investors view the potential return and risk connected with owning the stock. Market price by itself is not very informative, however, because companies have different numbers of shares outstanding, different earnings, and different dividend policies. Thus, market price must be related to earnings by considering the price/earnings (P/E) ratio and the dividends yield. Those ratios for **Starbucks** appear in Exhibit 14-12. We computed them by using the average market prices of Starbucks' stock during the fourth quarter of 2006, 2007, and 2008.

The **price/earnings (P/E) ratio**, which measures investors' confidence in a company, is the ratio of the market price per share to earnings per share. The P/E ratio is useful in comparing the earnings of different companies and the value of a company's shares in relation to values in the overall market. With a higher P/E ratio, the investor obtains less underlying earnings per dollar invested. Starbucks' P/E ratio fluctuated from 45.6 times in 2006 to 30.1 times in 2007 to 35.5 times in 2008, reflecting investor uneasiness in the stock market and the economy. Starbucks' stock price continued to slide from about \$34 in 2006 to about \$15 in 2008. Starbucks earnings per share had mixed results of \$0.74 in 2006, \$0.90 in 2007, and \$0.43 in 2008. In the 2008 Form 10-K management discussion and analysis of results, management stated, "Restructuring charges and costs associated with the execution of the transformation agenda impacted EPS by approximately \$0.28 per share in fiscal 2008."

The **dividends yield** measures a stock's current return to an investor in the form of dividends. Because Starbucks pays no dividends, we can conclude that those who invest in the company expect their return to come from increases in the stock's market value.

STOP & APPLY >

The Corner Cup, a local coffee bistro, engaged in the transactions listed in the first column of the following table. Opposite each transaction is a ratio and space to mark the effect of each transaction on the ratio. Place an X in the appropriate column to show whether the transaction increased, decreased, or had no effect on the ratio.

(continued)

Transaction	Ratio	Effect		
		Increase	Decrease	None
a. Accrued salaries.	Current ratio			
b. Purchased inventory.	Quick ratio			
c. Increased allowance for uncollectible accounts.	Receivable turnover			
d. Purchased inventory on credit.	Payables turnover			
e. Sold treasury stock.	Profit margin			
f. Borrowed cash by issuing bond payable.	Asset turnover			
g. Paid wages expense.	Return on assets			
h. Repaid bond payable.	Debt to equity			
i. Accrued interest expense.	Interest coverage			
k. Sold merchandise on account.	Return on equity			
l. Recorded depreciation expense.	Cash flow yield			
m. Sold equipment.	Free cash flow			

SOLUTION

Transaction	Ratio	Effect		
		Increase	Decrease	None
a. Accrued salaries.	Current ratio		X	
b. Purchased inventory.	Quick ratio		X	
c. Increased allowance for uncollectible accounts.	Receivable turnover	X		
d. Purchased inventory on credit.	Payables turnover		X	
e. Sold treasury stock.	Profit margin			X
f. Borrowed cash by issuing bond payable.	Asset turnover		X	
g. Paid wages expense.	Return on assets		X	
h. Repaid bond payable.	Debt to equity	X		
i. Accrued interest expense.	Interest coverage		X	
k. Sold merchandise on account.	Return on equity	X		
l. Recorded depreciation expense.	Cash flow yield	X		
m. Sold equipment.	Free cash flow	X		

A LOOK BACK AT ► STARBUCKS CORPORATION

To assess a company's financial performance, managers, stockholders, creditors, and other interested parties use measures that are linked to creating shareholder value. The Financial Highlights at the beginning of the chapter show that **Starbucks'** revenues, earnings, profit margin, and earnings per share appear highly sensitive to customer volume and economic ups and downs. However, but for a comprehensive view of the company's performance, users of Starbucks' financial statements must consider the following questions:

- What standards should be used to evaluate Starbucks' performance?
- What analytical tools are available to measure performance?
- How successful has the company's management been in creating value for shareholders?

Starbucks' performance should be compared with the performance of other companies in the same industry—the food and beverage specialty retail business. In addition,

Starbucks' performance in the current year should be compared with its performance in past years. To make this comparison, analysts employ horizontal or trend analysis, vertical analysis, and ratio analysis.

This chapter's comprehensive ratio analysis of Starbucks clearly shows the company's financial condition as stable for liquidity measures, with signs of weakness in 2008 in its profitability, long-term solvency, and cash flow adequacy ratios. This performance resulted in a decrease in earnings per share to \$0.43 in 2008 after an increase in earnings per share from 2006 to 2007 of \$0.74 to \$0.90. Shareholder value appears in decline as evidenced by the 2006–2008 downward trend in share price from \$34 to \$27 to \$15.

At Starbucks' 2008 annual meeting, CEO Howard Schultz summed up his management's analysis this way:

Despite the challenging economic environment, Starbucks is profitable, has a strong balance sheet and generates solid cash from operations. Our customers' connection with, and trust in the Starbucks brand remains at a high level. We are laser-focused on delivering the finest quality coffee and getting the customer experience right every time.¹¹

As for the future, Starbucks has two objectives: to increase profits in existing stores and to make strategic investments in key initiatives—for example, entering the instant coffee market. "We've been putting our feet into the shoes of our customers and responding directly to their needs," said Schultz. "Our customers are telling us they want value and quality and we will deliver that in a way that is both meaningful to them and authentic to Starbucks."¹²

Review Problem

Comparative Analysis of Two Companies

LO3

Suppose a company like **Starbucks** decided to analyze the coffee vending machine business as a new way to deliver value and convenience to customers. To learn more about selling hot beverages from machines in office buildings and schools, management decides to perform a comprehensive financial analysis of two successful cold beverage vending machine companies: Quik Cup and Big Taste. The balance sheets and income statements of Quik Cup and Big Taste are presented on the following pages.

The following information pertaining to 2010 is also available:

1. Quik Cup's statement of cash flows shows that it had net cash flows from operations of \$2,200,000. Big Taste's statement of cash flows shows that its net cash flows from operations were \$3,000,000.
2. Net capital expenditures were \$2,100,000 for Quik Cup and \$1,800,000 for Big Taste.
3. Quik Cup paid dividends of \$500,000, and Big Taste paid dividends of \$600,000.
4. The market prices of the stocks of Quik Cup and Big Taste were \$30 and \$20, respectively.

Financial information pertaining to prior years is not readily available.

Required

Perform a comprehensive ratio analysis of both Quik Cup and Big Taste following the steps outlined here. Assume that all notes payable of these two companies are current liabilities and that all their bonds payable are long-term liabilities. Show dollar amounts in thousands, use end-of-year balances for averages, assume no change in inventory, and round all ratios and percentages to one decimal place.

1. Prepare an analysis of liquidity.
2. Prepare an analysis of profitability.
3. Prepare an analysis of long-term solvency.
4. Prepare an analysis of cash flow adequacy.

5. Prepare an analysis of market strength.
6. In each analysis, indicate the company that apparently had the more favorable ratio. (Consider differences of .1 or less to be neutral.)
7. In what ways would having access to prior years' information aid this analysis?

A primary objective in management's use of financial performance measurement is to increase the wealth of the company's stockholders. Creditors and investors use financial performance measurement to judge a company's past performance and current position, as well as its future potential and the risk associated with it. Creditors use the information gained from their analyses to make reliable loans that will be repaid with interest. Investors use the information to make investments that will provide a return that is worth the risk.

	A	B	C
1	Balance Sheets		
2	December 31, 2010		
3	(In thousands)		
4		Quik Cup	Big Taste
5	Assets		
6	Cash	\$ 2,000	\$ 4,500
7	Accounts receivable (net)	2,000	6,500
8	Inventory	2,000	5,000
9	Property, plant, and equipment (net)	20,000	35,000
10	Other assets	4,000	5,000
11	Total assets	<u>\$30,000</u>	<u>\$56,000</u>
12			
13	Liabilities and Stockholders' Equity		
14	Accounts payable	\$ 2,500	\$ 3,000
15	Notes payable	1,500	4,000
16	Bonds payable	10,000	30,000
17	Common stock, \$1 par value	1,000	3,000
18	Additional paid-in capital	9,000	9,000
19	Retained earnings	6,000	7,000
20	Total liabilities and stockholders' equity	<u>\$30,000</u>	<u>\$56,000</u>
21			

	A	B	C
1	Income Statements		
2	For the Year Ended December 31, 2010		
3	(In thousands, except per share amounts)		
4		Quik Cup	Big Taste
5	Net sales	\$53,000	\$86,000
6	Costs and expenses		
7	Cost of goods sold	\$37,000	\$61,000
8	Selling expenses	7,000	10,000
9	Administrative expenses	4,000	5,000
10	Total costs and expenses	\$48,000	\$76,000
11	Income from operations	\$ 5,000	\$10,000
12	Interest expense	1,400	3,200
13	Income before income taxes	\$ 3,600	\$ 6,800
14	Income taxes	1,800	3,400
15	Net income	<u>\$ 1,800</u>	<u>\$ 3,400</u>
16	Earnings per share	<u>\$ 1.80</u>	<u>\$ 1.13</u>
17			

Answers to Review Problem

	A	B	C	D
1	Ratio Name	Quik Cup	Big Taste	6. Company with More Favorable Ratio
2	1. Liquidity analysis			
3	a. Current ratio	$\frac{\$2,000 + \$2,000 + \$2,000}{\$2,500 + \$1,500}$	$\frac{\$4,500 + \$6,500 + \$5,000}{\$3,000 + \$4,000}$	Big Taste
4		$= \frac{\$6,000}{\$4,000} = 1.5 \text{ times}$	$= \frac{\$16,000}{\$7,000} = 2.3 \text{ times}$	
5	b. Quick ratio	$\frac{\$2,000 + \$2,000}{\$2,500 + \$1,500}$	$= \frac{\$11,000}{\$7,000} = 1.6 \text{ times}$	Big Taste
6	c. Receivable turnover	$\frac{\$53,000}{\$2,000} = 26.5 \text{ times}$	$\frac{\$86,000}{\$6,500} = 13.2 \text{ times}$	Quik Cup
7	d. Days' sales uncollected	$\frac{365 \text{ days}}{26.5 \text{ times}} = 13.8 \text{ days}$	$\frac{365 \text{ days}}{13.2 \text{ times}} = 27.6 \text{ days}$	Quik Cup
8	e. Inventory turnover	$\frac{\$37,000}{\$2,000} = 18.5 \text{ times}$	$\frac{\$61,000}{\$5,000} = 12.2 \text{ times}$	Quik Cup
9	f. Days' inventory on hand	$\frac{365 \text{ days}}{18.5 \text{ times}} = 19.7 \text{ days}$	$\frac{365 \text{ days}}{12.2 \text{ times}} = 29.9 \text{ days}$	Quik Cup
10	g. Payables turnover	$\frac{\$37,000}{\$2,500} = 14.8 \text{ times}$	$\frac{\$61,000}{\$3,000} = 20.3 \text{ times}$	Big Taste
11	h. Days' payable	$\frac{365 \text{ days}}{20.3 \text{ times}} = 18.30 \text{ days}$	$\frac{365 \text{ days}}{20.3 \text{ times}} = 18.0 \text{ days}$	Big Taste
12	<i>Note:</i> This analysis indicates the company with the apparently more favorable ratio.			
13	Class discussion may focus on conditions under which different conclusions may be drawn.			

	A	B	C	D
1	Ratio Name	Quik Cup	Big Taste	6. Company with More Favorable Ratio
2	2. Profitability analysis			
3	a. Profit margin	$\frac{\$1,800}{\$53,000} = 3.4\%$	$\frac{\$3,400}{\$86,000} = 4.0\%$	Big Taste
4	b. Asset turnover	$\frac{\$53,000}{\$30,000} = 1.8 \text{ times}$	$\frac{\$86,000}{\$56,000} = 1.5 \text{ times}$	Quik Cup
5	c. Return on assets	$\frac{\$1,800}{\$30,000} = 6.0\%$	$\frac{\$1,800}{\$30,000} = 6.0\%$	Neutral
6	d. Return on equity	$\frac{\$1,800}{\$1,000 + \$9,000 + \$6,000} = \frac{\$1,800}{\$16,000} = 11.3\%$	$\frac{\$3,400}{\$3,000 + \$9,000 + \$7,000} = \frac{\$3,400}{\$19,000} = 17.9\%$	Big Taste

	A	B	C	D
1	Ratio Name	Quik Cup	Big Taste	6. Company with More Favorable Ratio
2	3. Long-term solvency analysis			
3	a. Debt to equity ratio	$\frac{\$2,500 + \$1,500 + \$10,000}{\$1,000 + \$9,000 + \$6,000}$	$\frac{\$3,000 + \$4,000 + \$30,000}{\$3,000 + \$9,000 + \$7,000}$	Quik Cup
4		$= \frac{\$14,000}{\$16,000} = 0.9 \text{ time}$	$= \frac{\$37,000}{\$19,000} = 1.9 \text{ times}$	
5	b. Interest coverage ratio	$\frac{\$3,600 + \$1,400}{\$1,400}$	$\frac{6,800 + \$3,200}{\$3,200}$	Quik Cup
6		$= \frac{\$5,000}{\$1,400} = 3.6 \text{ times}$	$= \frac{\$10,000}{\$3,200} = 3.1 \text{ times}$	

	A	B	C	D
1	Ratio Name	Quik Cup	Big Taste	6. Company with More Favorable Ratio
2	4. Cash flow adequacy analysis			
3	a. Cash flow yield	$\frac{\$2,200}{\$1,800} = 1.2 \text{ times}$	$\frac{\$2,200}{\$1,800} = 1.2 \text{ times}$	Quik Cup
4	b. Cash flows to sales	$\frac{\$2,200}{\$53,000} = 4.2\%$	$\frac{\$3,000}{\$86,000} = 3.5\%$	Quik Cup
5	c. Cash flows to assets	$\frac{\$2,200}{\$30,000} = 7.3\%$	$\frac{3,000}{\$56,000} = 5.4\%$	Quik Cup
6	d. Free cash flow	$\$2,200 - \$500 - \$2,100$	$\$3,000 - \$600 - \$1,800$	Big Taste
7		$= (\$400)$	$= \$600$	

	A	B	C	D
1	Ratio Name	Quik Cup	Big Taste	6. Company with More Favorable Ratio
2	5. Market strength analysis			
3	a. Price/earnings ratio	$\frac{\$30}{\$1.80} = 16.7 \text{ times}$	$\frac{\$20}{\$1.13} = 17.7 \text{ times}$	Big Taste
4	b. Dividends yield	$\frac{\$500,000 \div 1,000,000}{\$30}$	$\frac{\$600,000 \div 3,000,000}{\$20}$	
5		$= \frac{\$0.50}{\$30} = 1.7\%$	$= \frac{\$0.20}{\$20} = 1/0\%$	Quik
6	7. Prior years' information would be helpful in two ways. First, turnover, return, and cash flows to assets ratios could be based on average amounts. Second, a trend analysis could be performed for each company.			


STOP & REVIEW >
LO1 Describe the objectives, standards of comparison, sources of information, and compensation issues in measuring financial performance.

A primary objective in management's use of financial performance measurement is to increase the wealth of the company's stockholders. Creditors and investors use financial performance measurement to judge a company's past performance and current position, as well as its future potential and the risk associated with it. Creditors use the information gained from their analyses to make reliable loans that will be repaid with interest. Investors use the information to make investments that will provide a return that is worth the risk.

Three standards of comparison commonly used in evaluating financial performance are rule-of-thumb measures, a company's past performance, and industry norms. Rule-of-thumb measures are weak because of a lack of evidence that they can be widely applied. A company's past performance can offer a guideline for measuring improvement, but it is not helpful in judging performance relative to the performance of other companies. Although the use of industry norms overcomes this last problem, its disadvantage is that firms are not always comparable, even in the same industry.

The main sources of information about public corporations are reports that the corporations publish themselves, such as annual reports and interim financial statements; reports filed with the SEC; business periodicals; and credit and investment advisory services.

In public corporations, a committee made up of independent directors appointed by the board of directors determines the compensation of top executives. Although earnings per share can be regarded as a "bottom-line" number that encompasses all the other performance measures, using it as the sole basis for determining executive compensation may lead to management practices that are not in the best interests of the company or its stockholders.

LO2 Apply horizontal analysis, trend analysis, vertical analysis, and ratio analysis to financial statements.

Horizontal analysis involves the computation of changes in both dollar amounts and percentages from year to year.

Trend analysis is an extension of horizontal analysis in that it calculates percentage changes for several years. The analyst computes the changes by setting a base year equal to 100 and calculating the results for subsequent years as percentages of the base year.

Vertical analysis uses percentages to show the relationship of the component parts of a financial statement to a total figure in the statement. The resulting financial statements, which are expressed entirely in percentages, are called common-size statements.

Ratio analysis is a technique of financial performance evaluation that identifies key relationships between the components of the financial statements. To interpret ratios correctly, the analyst must have a general understanding of the company and its environment, financial data for several years or for several companies, and an understanding of the data underlying the numerators and denominators.

LO3 Apply ratio analysis to financial statements in a comprehensive evaluation of a company's financial performance.

A comprehensive ratio analysis includes the evaluation of a company's liquidity, as well as its profitability, long-term solvency, cash flow adequacy, and market strength. The ratios for measuring these characteristics are illustrated in Exhibits 14-8 through 14-12.

REVIEW of Concepts and Terminology

The following concepts and terms were introduced in this chapter:

Base year 563 (LO2)

Common-size statement 567 (LO2)

Compensation committee 561 (LO1)

Diversified companies 558 (LO1)

Financial performance measurement 556 (LO1)

Free cash flow 576 (LO3)

Horizontal analysis 563 (LO2)

Index number 566 (LO2)

Interim financial statements 559 (LO1)

Operating cycle 571 (LO3)

Ratio analysis 569 (LO2)

Trend analysis 566 (LO2)

Vertical analysis 567 (LO2)

Key Ratios

Asset turnover 573 (LO3)

Cash flows to assets 576 (LO3)

Cash flows to sales 576 (LO3)

Cash flow yield 575 (LO3)

Current ratio 571 (LO3)

Days' inventory on hand 571 (LO3)

Days' payable 573 (LO3)

Days' sales uncollected 571 (LO3)

Debt to equity ratio 574 (LO3)

Dividends yield 577 (LO3)

Interest coverage ratio 575 (LO3)

Inventory turnover 571 (LO3)

Payables turnover 573 (LO3)

Price/earnings (P/E) ratio 577 (LO3)

Profit margin 573 (LO3)

Quick ratio 571 (LO3)

Receivable turnover 571 (LO3)

Return on assets 573 (LO3)

Return on equity 574 (LO3)

CHAPTER ASSIGNMENTS

BUILDING Your Basic Knowledge and Skills

Short Exercises

L01 Objectives and Standards of Financial Performance Evaluation

SE 1. Indicate whether each of the following items is (a) an objective or (b) a standard of comparison of financial statement analysis:

1. Industry norms
2. Assessment of a company's past performance
3. The company's past performance
4. Assessment of future potential and related risk
5. Rule-of-thumb measures

L01 Sources of Information

SE 2. For each piece of information in the list that follows, indicate whether the best source would be (a) reports published by the company, (b) SEC reports, (c) business periodicals, or (d) credit and investment advisory services.

1. Current market value of a company's stock
2. Management's analysis of the past year's operations
3. Objective assessment of a company's financial performance
4. Most complete body of financial disclosures
5. Current events affecting the company

L02 Trend Analysis

SE 3. Using 2009 as the base year, prepare a trend analysis for the following data, and tell whether the results suggest a favorable or unfavorable trend. (Round your answers to one decimal place.)

	2011	2010	2009
Net sales	\$158,000	\$136,000	\$112,000
Accounts receivable (net)	43,000	32,000	21,000

L02 Horizontal Analysis

SE 4. The comparative income statements and balance sheets of Sarot, Inc., appear on the opposite page. Compute the amount and percentage changes for the income statements, and comment on the changes from 2009 to 2010. (Round the percentage changes to one decimal place.)

L02 Vertical Analysis

SE 5. Express the comparative balance sheets of Sarot, Inc. (shown on the opposite page) as common-size statements, and comment on the changes from 2009 to 2010. (Round computations to one decimal place.)

L03 Liquidity Analysis

SE 6. Using the information for Sarot, Inc., in **SE 4** and **SE 5**, compute the current ratio, quick ratio, receivable turnover, days' sales uncollected, inventory turnover, days' inventory on hand, payables turnover, and days' payable for 2009 and 2010. Inventories were \$16,000 in 2008, \$20,000 in 2009, and \$28,000 in 2010. Accounts receivable were \$24,000 in 2008, \$32,000 in 2009, and \$40,000 in 2010. Accounts payable were \$36,000 in 2008, \$40,000 in 2009, and \$48,000

Sarot, Inc.
Comparative Income Statements
For the Years Ended December 31, 2010 and 2009

	2010	2009
Net sales	\$720,000	\$580,000
Cost of goods sold	<u>448,000</u>	<u>352,000</u>
Gross margin	\$272,000	\$228,000
Operating expenses	<u>160,000</u>	<u>120,000</u>
Operating income	\$112,000	\$108,000
Interest expense	<u>28,000</u>	<u>20,000</u>
Income before income taxes	\$ 84,000	\$ 88,000
Income taxes expense	<u>28,000</u>	<u>32,000</u>
Net income	<u>\$ 56,000</u>	<u>\$ 56,000</u>
Earnings per share	<u>\$ 2.80</u>	<u>\$ 2.80</u>

Sarot, Inc.
Comparative Balance Sheets
December 31, 2010 and 2009

	2010	2009
Assets		
Current assets	\$ 96,000	\$ 80,000
Property, plant, and equipment (net)	<u>520,000</u>	<u>400,000</u>
Total assets	<u>\$616,000</u>	<u>\$480,000</u>
Liabilities and Stockholders' Equity		
Current liabilities	\$ 72,000	\$ 88,000
Long-term liabilities	360,000	240,000
Stockholders' equity	<u>184,000</u>	<u>152,000</u>
Total liabilities and stockholders' equity	<u>\$616,000</u>	<u>\$480,000</u>

in 2010. The company had no marketable securities or prepaid assets. Comment on the results. (Round computations to one decimal place.)

L03 Profitability Analysis

SE 7. Using the information for Sarot, Inc., in **SE 4** and **SE 5**, compute the profit margin, asset turnover, return on assets, and return on equity for 2009 and 2010. In 2008, total assets were \$400,000 and total stockholders' equity was \$120,000. Comment on the results. (Round computations to one decimal place.)

L03 Long-term Solvency Analysis

SE 8. Using the information for Sarot, Inc., in **SE 4** and **SE 5**, compute the debt to equity ratio and the interest coverage ratio for 2009 and 2010. Comment on the results. (Round computations to one decimal place.)

L03 Cash Flow Adequacy Analysis

SE 9. Using the information for Sarot, Inc., in **SE 4**, **SE 5**, and **SE 7**, compute the cash flow yield, cash flows to sales, cash flows to assets, and free cash flow for 2009 and 2010. Net cash flows from operating activities were \$84,000 in 2009 and \$64,000 in 2010. Net capital expenditures were \$120,000 in 2009 and

\$160,000 in 2010. Cash dividends were \$24,000 in both years. Comment on the results. (Round computations to one decimal place.)

L03 Market Strength Analysis

SE 10. Using the information for Sarot, Inc., in **SE 4**, **SE 5**, and **SE 9**, compute the price/earnings (P/E) ratio and dividends yield for 2009 and 2010. The company had 20,000 shares of common stock outstanding in both years. The price of Sarot's common stock was \$60 in 2009 and \$40 in 2010. Comment on the results. (Round computations to one decimal place.)

Exercises

L01 L02 Discussion Questions

E 1. Develop brief answers to each of the following questions:

1. Why is it essential that management compensation, including bonuses, be linked to financial goals and strategies that achieve shareholder value?
2. How are past performance and industry norms useful in evaluating a company's performance? What are their limitations?
3. In a five-year trend analysis, why do the dollar values remain the same for their respective years while the percentages usually change when a new five-year period is chosen?

L03 Discussion Questions

E 2. Develop brief answers to each of the following questions:

1. Why does a decrease in receivable turnover create the need for cash from operating activities?
2. Why would ratios that include one balance sheet account and one income statement account, such as receivable turnover or return on assets, be questionable if they came from quarterly or other interim financial reports?
3. What is a limitation of free cash flow in comparing one company to another?

L01 Issues in Financial Performance Evaluation: Objectives, Standards, Sources of Information, and Executive Compensation

E 3. Identify each of the following as (a) an objective of financial statement analysis, (b) a standard for financial statement analysis, (c) a source of information for financial statement analysis, or (d) an executive compensation issue:

1. Average ratios of other companies in the same industry
2. Assessment of the future potential of an investment
3. Interim financial statements
4. Past ratios of the company
5. SEC Form 10-K
6. Assessment of risk
7. A company's annual report
8. Linking performance to shareholder value

L01 Standards for Financial Performance Evaluation

E 4. **Standard & Poor's** Ratings Group, the large financial company that evaluates the riskiness of companies' debt, downgraded its rating of **General Motors** and **Ford Motor Co.** debt to "junk" bond status because of concerns about the companies' profitability and cash flows. Despite aggressive cost cutting, both companies still face substantial future liabilities for health care and pension obligations. They are losing money or barely breaking even on auto operations that concentrate on slow-selling SUVs. High gas prices and competition force them to sell the cars at a discount.¹³

What standards do you think Standard & Poor's would use to evaluate Ford's progress? What performance measures would Standard & Poor's most likely use in making its evaluation?

L01 Using Segment Information

E 5. Refer to Exhibit 14-1, which shows the segment information of **Starbucks Corporation**. In what business segments does Starbucks operate? What is the relative size of its business segments in terms of sales and income in the most recent year shown? Which segment is most profitable in terms of return on assets?

L01 Using Investors' Services

E 6. Refer to Exhibit 14-2, which contains the **PepsiCo Inc.** listing from Merger's *Handbook of Dividend Achievers*. Assume that an investor has asked you to assess PepsiCo's recent history and prospects. Write a memorandum to the investor that addresses the following points:

1. PepsiCo's earnings history. What has been the general relationship between PepsiCo's return on assets and its return on equity over the last seven years? What does this tell you about the way the company is financed? What figures back up your conclusion?
2. The trend of PepsiCo's stock price and price/earnings (P/E) ratio for the seven years shown.
3. PepsiCo's prospects, including developments likely to affect the company's future.

L02 Trend Analysis

E 7. Using 2006 as the base year, prepare a trend analysis of the following data, and tell whether the situation shown by the trends is favorable or unfavorable. (Round your answers to one decimal place.)

	2010	2009	2008	2007	2006
Net sales	\$25,520	\$23,980	\$24,200	\$22,880	\$22,000
Cost of goods sold	17,220	15,400	15,540	14,700	14,000
General and administrative expenses	5,280	5,184	5,088	4,896	4,800
Operating income	3,020	3,396	3,572	3,284	3,200

L02 Horizontal Analysis

E 8. Compute the amount and percentage changes for the following balance sheets for Davis Company, and comment on the changes from 2009 to 2010. (Round the percentage changes to one decimal place.)

Davis Company		
Comparative Balance Sheets		
December 31, 2010 and 2009		
	2010	2009
Assets		
Current assets	\$ 18,600	\$ 12,800
Property, plant, and equipment (net)	109,464	97,200
Total assets	<u>\$128,064</u>	<u>\$110,000</u>
Liabilities and Stockholders' Equity		
Current liabilities	\$ 11,200	\$ 3,200
Long-term liabilities	35,000	40,000
Stockholders' equity	81,864	66,800
Total liabilities and stockholders' equity	<u>\$128,064</u>	<u>\$110,000</u>

L02 Vertical Analysis

E 9. Express the partial comparative income statements for Davis Company that follow as common-size statements, and comment on the changes from 2009 to 2010. (Round computations to one decimal place.)

Davis Company		
Partial Comparative Income Statements		
For the Years Ended December 31, 2010 and 2009		
	2010	2009
Net sales	\$212,000	\$184,000
Cost of goods sold	<u>127,200</u>	<u>119,600</u>
Gross margin	<u>\$ 84,800</u>	<u>\$ 64,400</u>
Selling expenses	\$ 53,000	\$ 36,800
General expenses	<u>25,440</u>	<u>18,400</u>
Total operating expenses	<u>\$ 78,440</u>	<u>\$ 55,200</u>
Operating income	<u>\$ 6,360</u>	<u>\$ 9,200</u>

L03 Liquidity Analysis

E 10. Partial comparative balance sheet and income statement information for Smith Company is as follows:

	2011	2010
Cash	\$ 27,200	\$ 20,800
Marketable securities	14,400	34,400
Accounts receivable (net)	89,600	71,200
Inventory	<u>108,800</u>	<u>99,200</u>
Total current assets	<u>\$240,000</u>	<u>\$225,600</u>
Accounts payable	<u>\$ 80,000</u>	<u>\$ 56,400</u>
Net sales	\$645,120	\$441,440
Cost of goods sold	435,200	406,720
Gross margin	<u>\$209,920</u>	<u>\$ 34,720</u>

In 2009, the year-end balances for Accounts Receivable and Inventory were \$64,800 and \$102,400, respectively. Accounts Payable was \$61,200 in 2009 and is the only current liability. Compute the current ratio, quick ratio, receivable turnover, days' sales uncollected, inventory turnover, days' inventory on hand, payables turnover, and days' payable for each year. (Round computations to one decimal place.) Comment on the change in the company's liquidity position.

L03 Operating Cycle

E 11. Using the information for Smith Company in **E 10**, compute the operating cycle and finance period for both years. Comment on the change in the company's operating cycle and required days of financing from 2010 to 2011.

L03 Turnover Analysis

E 12. Modern Suits Rental has been in business for four years. Because the company has recently had a cash flow problem, management wonders whether there is a problem with receivables or inventories. Selected figures from the company's financial statements (in thousands) follow.

	2011	2010	2009	2008
Net sales	\$288.0	\$224.0	\$192.0	\$160.0
Cost of goods sold	180.0	144.0	120.0	96.0
Accounts receivable (net)	48.0	40.0	32.0	24.0
Merchandise inventory	56.0	44.0	32.0	20.0
Accounts payable	26.0	20.0	16.0	10.0

Compute the receivable turnover, inventory turnover, and payables turnover for each of the four years, and comment on the results relative to the cash flow problem that the firm has been experiencing. Merchandise inventory was \$22,000, accounts receivable were \$22,000, and accounts payable were \$8,000 in 2007. (Round computations to one decimal place.)

L03 Profitability Analysis

E 13. Barr Company had total assets of \$320,000 in 2008, \$340,000 in 2009, and \$380,000 in 2010. The company's debt to equity ratio was .67 times in all three years. In 2009, Barr had net income of \$38,556 on revenues of \$612,000. In 2010, it had net income of \$49,476 on revenues of \$798,000. Compute the profit margin, asset turnover, return on assets, and return on equity for 2009 and 2010. Comment on the apparent cause of the increase or decrease in profitability. (Round the percentages and other ratios to one decimal place.)

L03 Long-term Solvency and Market Strength Ratios

E 14. An investor is trying to decide whether to invest in the long-term bonds and common stock of Companies P and R. Both companies operate in the same industry. Both also pay a dividend per share of \$4 and have a yield of 5 percent on their long-term bonds. Other data for the two companies are as follows:

	Company P	Company R
Total assets	\$2,400,000	\$1,080,000
Total liabilities	1,080,000	594,000
Income before income taxes	288,000	129,600
Interest expense	97,200	53,460
Earnings per share	3.20	5.00
Market price of common stock	40.00	47.50

Compute the debt to equity, interest coverage, and price/earnings (P/E) ratios, as well as the dividends yield, and comment on the results. (Round computations to one decimal place.)

L03 Cash Flow Adequacy Analysis

E 15. Using the following data from the financial statements of Bali, Inc., compute the company's cash flow yield, cash flows to sales, cash flows to assets, and free cash flow. (Round computations to one decimal place.)

Net sales	\$1,600,000
Net income	176,000
Net cash flows from operating activities	228,000
Total assets, beginning of year	1,445,000
Total assets, end of year	1,560,000
Cash dividends	60,000
Net capital expenditures	149,000

Problems

L02 Horizontal and Vertical Analysis

P 1. Robert Corporation's condensed comparative balance sheets and condensed comparative income statements for 2011 and 2010 follow.

Robert Corporation		
Comparative Balance Sheets		
December 31, 2011 and 2010		
	2011	2010
Assets		
Cash	\$ 40,600	\$ 20,400
Accounts receivable (net)	117,800	114,600
Inventory	287,400	297,400
Property, plant, and equipment (net)	<u>375,000</u>	<u>360,000</u>
Total assets	<u>\$820,800</u>	<u>\$792,400</u>
Liabilities and Stockholders' Equity		
Accounts payable	\$133,800	\$238,600
Notes payable (short-term)	100,000	200,000
Bonds payable	200,000	—
Common stock, \$10 par value	200,000	200,000
Retained earnings	<u>187,000</u>	<u>153,800</u>
Total liabilities and stockholders' equity	<u>\$820,800</u>	<u>\$792,400</u>

Robert Corporation		
Comparative Income Statements		
For the Years Ended December 31, 2011 and 2010		
	2011	2010
Net sales	\$1,638,400	\$1,573,200
Cost of goods sold	<u>1,044,400</u>	<u>1,004,200</u>
Gross margin	<u>\$ 594,000</u>	<u>\$ 569,000</u>
Operating expenses		
Selling expenses	\$ 238,400	\$ 259,000
Administrative expenses	<u>223,600</u>	<u>211,600</u>
Total operating expenses	<u>\$ 462,000</u>	<u>\$ 470,600</u>
Income from operations	\$ 132,000	\$ 98,400
Interest expense	<u>32,800</u>	<u>19,600</u>
Income before income taxes	\$ 99,200	\$ 78,800
Income taxes expense	<u>31,200</u>	<u>28,400</u>
Net income	<u>\$ 68,000</u>	<u>\$ 50,400</u>
Earnings per share	<u>\$ 3.40</u>	<u>\$ 2.52</u>

Required

- Manager insight** ▶
1. Prepare schedules showing the amount and percentage changes from 2010 to 2011 for the comparative income statements and the balance sheets.
 2. Prepare common-size income statements and balance sheets for 2010 and 2011.
 3. Comment on the results in requirements **1** and **2** by identifying favorable and unfavorable changes in the components and composition of the statements.

LO3 Comprehensive Ratio Analysis

P 2. Data for Robert Corporation in 2011 and 2010 follow. These data should be used in conjunction with the data in **P 1**.

	2011	2010
Net cash flows from operating activities	(\$98,000)	\$72,000
Net capital expenditures	\$20,000	\$32,500
Dividends paid	\$22,000	\$17,200
Number of common shares	20,000	20,000
Market price per share	\$18	\$30

Selected balances at the end of 2009 were accounts receivable (net), \$103,400; inventory, \$273,600; total assets, \$732,800; accounts payable, \$193,300; and stockholders' equity, \$320,600. All Robert's notes payable were current liabilities; all its bonds payable were long-term liabilities.

Required

Perform a comprehensive ratio analysis. Round all answers to one decimal place.

1. Prepare a liquidity analysis by calculating for each year the (a) current ratio, (b) quick ratio, (c) receivable turnover, (d) days' sales uncollected, (e) inventory turnover, (f) days' inventory on hand, (g) payables turnover, and (h) days' payable.
 2. Prepare a profitability analysis by calculating for each year the (a) profit margin, (b) asset turnover, (c) return on assets, and (d) return on equity.
 3. Prepare a long-term solvency analysis by calculating for each year the (a) debt to equity ratio and (b) interest coverage ratio.
 4. Prepare a cash flow adequacy analysis by calculating for each year the (a) cash flow yield, (b) cash flows to sales, (c) cash flows to assets, and (d) free cash flow.
 5. Prepare a market strength analysis by calculating for each year the (a) price/earnings (P/E) ratio and (b) dividends yield.
 6. After making the calculations, indicate whether each ratio improved or deteriorated from 2010 to 2011 (use *F* for favorable and *U* for unfavorable and consider changes of 0.1 or less to be neutral).
- User insight** ▶

LO3 Effects of Transactions on Ratios

P 3. Sung Corporation, a clothing retailer, engaged in the transactions listed in the first column of the table that follows. Opposite each transaction is a ratio and space to mark the effect of each transaction on the ratio.

Transaction	Ratio	Effect		
		Increase	Decrease	None
a. Issued common stock for cash.	Asset turnover			
b. Declared cash dividend.	Current ratio			
c. Sold treasury stock.	Return on equity			
d. Borrowed cash by issuing note payable.	Debt to equity ratio			
e. Paid salaries expense.	Inventory turnover			
f. Purchased merchandise for cash.	Current ratio			
g. Sold equipment for cash.	Receivable turnover			
h. Sold merchandise on account.	Quick ratio			
i. Paid current portion of long-term debt.	Return on assets			
j. Gave sales discount.	Profit margin			
k. Purchased marketable securities for cash.	Quick ratio			
l. Declared 5% stock dividend.	Current ratio			
m. Purchased a building.	Free cash flow			

Required

User insight ▶ Place an X in the appropriate column to show whether the transaction increased, decreased, or had no effect on the indicated ratio.

L03 Comprehensive Ratio Analysis

P 4. The condensed comparative income statements of Tola Corporation follow. The corporation's condensed comparative balance sheets are presented on the next page. All figures are given in thousands of dollars, except earnings per share and market price per share. Additional data for Tola Corporation in 2011 and 2010 are as follows:

	2011	2010
Net cash flows from operating activities	\$32,000	\$49,500
Net capital expenditures	\$59,500	\$19,000
Dividends paid	\$15,700	\$17,500
Number of common shares	15,000	15,000
Market price per share	\$40	\$60

Tola Corporation
Comparative Income Statements
For the Years Ended December 31, 2011 and 2010

	2011	2010
Net sales	\$400,200	\$371,300
Cost of goods sold	227,050	198,100
Gross margin	<u>\$173,150</u>	<u>\$173,200</u>
Operating expenses		
Selling expenses	\$ 65,050	\$ 52,300
Administrative expenses	70,150	57,750
Total operating expenses	<u>\$135,200</u>	<u>\$110,050</u>
Income from operations	\$ 37,950	\$ 63,150
Interest expense	12,500	10,000
Income before income taxes	\$ 25,450	\$ 53,150
Income taxes expense	7,000	17,500
Net income	<u>\$ 18,450</u>	<u>\$ 35,650</u>
Earnings per share	<u>\$ 1.23</u>	<u>\$ 2.38</u>

Tola Corporation			
Comparative Balance Sheets			
December 31, 2011 and 2010			
	2011	2010	
Assets			
Cash	\$ 15,550	\$ 13,600	
Accounts receivable (net)	36,250	21,350	
Inventory	61,300	53,900	
Property, plant, and equipment (net)	288,850	253,750	
Total assets	<u>\$401,950</u>	<u>\$342,600</u>	
Liabilities and Stockholders' Equity			
Accounts payable	\$ 52,350	\$ 36,150	
Notes payable	25,000	25,000	
Bonds payable	100,000	55,000	
Common stock, \$10 par value	150,000	150,000	
Retained earnings	74,600	76,450	
Total liabilities and stockholders' equity	<u>\$401,950</u>	<u>\$342,600</u>	

Balances of selected accounts at the end of 2009 were accounts receivable (net), \$26,350; inventory, \$49,700; accounts payable, \$32,400; total assets, \$323,900; and stockholders' equity, \$188,300. All of the bonds payable were long-term liabilities.

Required

Perform a comprehensive analyses. Round percentages and ratios to one decimal place.

1. Prepare a liquidity analysis by calculating for each year the (a) current ratio, (b) quick ratio, (c) receivable turnover, (d) days' sales uncollected, (e) inventory turnover, (f) days' inventory on hand, (g) payables turnover, and (h) days' payable.
2. Prepare a profitability analysis by calculating for each year the (a) profit margin, (b) asset turnover, (c) return on assets, and (d) return on equity.
3. Prepare a long-term solvency analysis by calculating for each year the (a) debt to equity ratio and (b) interest coverage ratio.
4. Prepare a cash flow adequacy analysis by calculating for each year the (a) cash flow yield, (b) cash flows to sales, (c) cash flows to assets, and (d) free cash flow.
5. Prepare an analysis of market strength by calculating for each year the (a) price/earnings (P/E) ratio and (b) dividends yield.
6. After making the calculations, indicate whether each ratio improved or deteriorated from 2010 to 2011 (use *F* for favorable and *U* for unfavorable and consider changes of 0.1 or less to be neutral).

User insight ►

L03 Comprehensive Ratio Analysis of Two Companies

P 5. Agnes Ball is considering an investment in the common stock of a chain of retail department stores. She has narrowed her choice to two retail companies, Fast Corporation and Style Corporation, whose income statements and balance sheets are presented below.

During the year, Fast Corporation paid a total of \$50,000 in dividends. The market price per share of its stock is currently \$60. In comparison, Style Corporation paid a total of \$114,000 in dividends, and the current market price of its stock is \$76 per share. Fast Corporation had net cash flows from operations of \$271,500 and net capital expenditures of \$625,000. Style Corporation had net cash flows from operations of \$492,500 and net capital expenditures of \$1,050,000. Information for prior years is not readily available. Assume that all notes payable are current liabilities and all bonds payable are long-term liabilities and that there is no change in inventory.

Income Statements

	Fast	Style
Net sales	\$12,560,000	\$25,210,000
Costs and expenses		
Cost of goods sold	\$ 6,142,000	\$14,834,000
Selling expenses	4,822,600	7,108,200
Administrative expenses	986,000	2,434,000
Total costs and expenses	<u>\$11,950,600</u>	<u>\$24,376,200</u>
Income from operations	\$ 609,400	\$ 833,800
Interest expense	194,000	228,000
Income before income taxes	<u>\$ 415,400</u>	<u>\$ 605,800</u>
Income taxes expense	200,000	300,000
Net income	<u>\$ 215,400</u>	<u>\$ 305,800</u>
Earnings per share	<u>\$ 4.31</u>	<u>\$ 10.19</u>

Balance Sheets

	Fast	Style
Assets		
Cash	\$ 80,000	\$ 192,400
Marketable securities (at cost)	203,400	84,600
Accounts receivable (net)	552,800	985,400
Inventory	629,800	1,253,400
Prepaid expenses	54,400	114,000
Property, plant, and equipment (net)	2,913,600	6,552,000
Intangibles and other assets	553,200	144,800
Total assets	<u>\$4,987,200</u>	<u>\$9,326,600</u>

Liabilities and Stockholders' Equity

Accounts payable	\$ 344,000	\$ 572,600
Notes payable	150,000	400,000
Income taxes payable	50,200	73,400
Bonds payable	2,000,000	2,000,000
Common stock, \$20 par value	1,000,000	600,000
Additional paid-in capital	609,800	3,568,600
Retained earnings	<u>833,200</u>	<u>2,112,000</u>
Total liabilities and stockholders' equity	<u>\$4,987,200</u>	<u>\$9,326,600</u>

Required

Conduct a comprehensive ratio analysis for each company. Compare the results. Round percentages and ratios to one decimal place, and consider changes of .1 or less to be indeterminate.

1. Prepare a liquidity analysis by calculating for each company the (a) current ratio, (b) quick ratio, (c) receivable turnover, (d) days' sales uncollected, (e) inventory turnover, (f) days' inventory on hand, (g) payables turnover, and (h) days' payable.
2. Prepare a profitability analysis by calculating for each company the (a) profit margin, (b) asset turnover, (c) return on assets, and (d) return on equity.
3. Prepare a long-term solvency analysis by calculating for each company the (a) debt to equity ratio and (b) interest coverage ratio.
4. Prepare a cash flow adequacy analysis by calculating for each company the (a) cash flow yield, (b) cash flows to sales, (c) cash flows to assets, and (d) free cash flow.
5. Prepare an analysis of market strength by calculating for each company the (a) price/earnings (P/E) ratio and (b) dividends yield.
- User insight** ▶ 6. Compare the two companies by inserting the ratio calculations from **1** through **5** in a table with the following column headings: Ratio, Name, Fast, Style, and Company with More Favorable Ratio. Indicate in the last column which company had the more favorable ratio in each case.
- User insight** ▶ 7. How could the analysis be improved if information about these companies' prior years were available?

Alternate Problems**L02 Horizontal and Vertical Analysis**

P 6. Spain Corporation's condensed comparative balance sheets and condensed comparative income statements for 2011 and 2010 follow.

Spain Corporation		
Comparative Balance Sheets		
December 31, 2011 and 2010		
	2011	2010
Assets		
Cash	\$ 50,000	\$ 60,000
Accounts receivable (net)	120,000	100,000
Inventory	400,000	300,000
Property, plant, and equipment (net)	330,000	40,000
Total assets	<u>\$900,000</u>	<u>\$800,000</u>
Liabilities and Stockholders' Equity		
Accounts payable	\$200,000	\$200,000
Notes payable (short-term)	100,000	200,000
Bonds payable	100,000	—
Common stock, \$20 par value	200,000	200,000
Retained earnings	300,000	200,000
Total liabilities and stockholders' equity	<u>\$900,000</u>	<u>\$800,000</u>

Spain Corporation
Comparative Income Statements
For the Years Ended December 31, 2011 and 2010

	2011	2010
Net sales	\$ 1,300,000	\$ 1,200,000
Cost of goods sold	630,000	600,000
Gross margin	<u>\$ 670,000</u>	<u>\$ 600,000</u>
Operating expenses		
Selling expenses	\$ 100,000	\$ 100,000
Administrative expenses	400,000	300,000
Total operating expenses	<u>\$ 500,000</u>	<u>\$ 400,000</u>
Income from operations	<u>\$ 170,000</u>	<u>\$ 200,000</u>
Interest expense	30,000	20,000
Income before income taxes	<u>\$ 140,000</u>	<u>\$ 180,000</u>
Income taxes expense	40,000	50,000
Net income	<u>\$ 100,000</u>	<u>\$ 130,000</u>
Earnings per share	<u>\$ 10.00</u>	<u>\$ 13.00</u>

Required

1. Prepare schedules showing the amount and percentage changes from 2010 to 2011 for the comparative income statements and the balance sheets.
2. Prepare common-size income statements and balance sheets for 2010 and 2011.
3. Comment on the results in requirements 1 and 2 by identifying favorable and unfavorable changes in the components and composition of the statements.

User insight ►**L03 Comprehensive Ratio Analysis**

P 7. Data for Spain Corporation in 2011 and 2010 follow. These data should be used in conjunction with the data in **P 6**.

	2011	2010
Net cash flows from operating activities	(\$50,000)	\$26,000
Net capital expenditures	\$10,000	\$20,000
Dividends paid	\$10,000	\$12,000
Number of common shares	10,000	10,000
Market price per share	\$20	\$25

Selected balances at the end of 2009 were accounts receivable (net), \$90,000; inventory, \$270,000; total assets, \$750,000; accounts payable, \$150,000; and stockholders' equity, \$350,000. All Spain's notes payable were current liabilities; all its bonds payable were long-term liabilities.

Required

Perform a comprehensive ratio analysis. Round all answers to one decimal place.

1. Prepare a liquidity analysis by calculating for each year the (a) current ratio, (b) quick ratio, (c) receivable turnover, (d) days' sales uncollected, (e) inventory turnover, (f) days' inventory on hand, (g) payables turnover, and (h) days' payable.
2. Prepare a profitability analysis by calculating for each year the (a) profit margin, (b) asset turnover, (c) return on assets, and (d) return on equity.
3. Prepare a long-term solvency analysis by calculating for each year the (a) debt to equity ratio and (b) interest coverage ratio.

- User insight** ▶
4. Prepare a cash flow adequacy analysis by calculating for each year the (a) cash flow yield, (b) cash flows to sales, (c) cash flows to assets, and (d) free cash flow.
 5. Prepare a market strength analysis by calculating for each year the (a) price/earnings (P/E) ratio and (b) dividends yield.
 6. After making the calculations, indicate whether each ratio improved or deteriorated from 2010 to 2011 (use *F* for favorable and *U* for unfavorable and consider changes of 0.1 or less to be neutral).

LO3 Effects of Transactions on Ratios

P 8. Alp Corporation engaged in the transactions listed in the first column of the following table. Opposite each transaction is a ratio and space to indicate the effect of each transaction on the ratio.

Transaction	Ratio	Effect		
		Increase	Decrease	None
a. Issued common stock for cash.	Asset turnover			
b. Borrowed cash by issuing a note payable.	Debt to equity ratio			
c. Purchase merchandise for cash.	Current ratio			
d. Pay salary expense.	Inventory turnover			
e. Sold equipment for cash.	Receivable turnover			
f. Sold merchandise on account.	Quick ratio			
g. Paid current portion of long-term debt.	Return on assets			
h. Issued stock dividend.	Current ratio			
i. Issued bonds payable.	Asset turnover			
j. Accrued salaries.	Current ratio			
k. Declared cash dividend.	Current ratio			
l. Sold treasury stock.	Profit margin			
m. Recorded depreciation for the year.	Cash flow yield			

Required

- User insight** ▶ Place an X in the appropriate column to show whether the transaction increased, decreased, or had no effect on the indicated ratio.

LO3 Comprehensive Ratio Analysis

P 9. The condensed comparative income statements and balance sheets of UK Corporation are presented on the next page. All figures are given in thousands of dollars, except earnings per share and market price per share. Additional data for UK Corporation in 2011 and 2010 are as follows:

	2011	2010
Net cash flows from operating activities	\$100,000	\$80,000
Net capital expenditures	\$80,000	\$50,000
Dividends paid	\$30,000	\$25,000
Number of common shares	20,000	20,000
Market price per share	\$70	\$50

Balances of selected accounts at the end of 2009 were accounts receivable (net), \$15,000; inventory, \$50,000; accounts payable, \$24,000; total assets, \$250,000; and stockholders' equity, \$200,000. All of the bonds payable were long-term liabilities.

UK Corporation
Comparative Income Statements
For the Years Ended December 31, 2011 and 2010

	2011	2010
Net sales	\$400,000	\$360,000
Cost of goods sold	200,000	200,000
Gross margin	<u>\$200,000</u>	<u>\$160,000</u>
Operating expenses		
Selling expenses	\$ 50,000	\$ 40,000
Administrative expenses	60,000	70,000
Total operating expenses	<u>\$110,000</u>	<u>\$110,000</u>
Income from operations	\$ 90,000	\$ 50,000
Interest expense	15,000	10,000
Income before income taxes	\$ 75,000	\$ 40,000
Income taxes expense	10,000	6,000
Net income	<u>\$ 65,000</u>	<u>\$ 34,000</u>
Earnings per share	<u>\$ 3.25</u>	<u>\$ 1.70</u>

UK Corporation
Comparative Balance Sheets
December 31, 2011 and 2010

	2011	2010
Assets		
Cash	\$ 25,000	\$ 20,000
Accounts receivable (net)	21,000	18,000
Inventory	49,000	52,000
Property, plant, and equipment (net)	205,000	200,000
Total assets	<u>\$300,000</u>	<u>\$290,000</u>
Liabilities and Stockholders' Equity		
Accounts payable	\$ 50,000	\$ 30,000
Notes payable	10,000	—
Bonds payable	10,000	40,000
Common stock, \$10 par value	200,000	200,000
Retained earnings	30,000	20,000
Total liabilities and stockholders' equity	<u>\$300,000</u>	<u>\$290,000</u>

Required

Perform a comprehensive ratio analysis. Round percentages and ratios to one decimal place.

1. Prepare a liquidity analysis by calculating for each year the (a) current ratio, (b) quick ratio, (c) receivable turnover, (d) days' sales uncollected, (e) inventory turnover, (f) days' inventory on hand, (g) payables turnover, and (h) days' payable.
2. Prepare a profitability analysis by calculating for each year the (a) profit margin, (b) asset turnover, (c) return on assets, and (d) return on equity.
3. Prepare a long-term solvency analysis by calculating for each year the (a) debt to equity ratio and (b) interest coverage ratio.
4. Prepare a cash flow adequacy analysis by calculating for each year the (a) cash flow yield, (b) cash flows to sales, (c) cash flows to assets, and (d) free cash flow.

User insight ►

5. Prepare an analysis of market strength by calculating for each year the (a) price/earnings (P/E) ratio and (b) dividends yield.
6. After making the calculations, indicate whether each ratio improved or deteriorated from 2010 to 2011 (use *F* for favorable and *U* for unfavorable and consider changes of 0.1 or less to be neutral).

L03 Comprehensive Ratio Analysis of Two Companies

P 10. Caitlin Cleary is considering an investment in the common stock of a chain of souvenir stores. She has narrowed her choice to two companies, Dover Corporation and Calais Corporation, whose income statements and balance sheets are presented here.

During the year, Dover Corporation paid a total of \$50,000 in dividends. The market price per share of its stock is currently \$60. In comparison, Calais Corporation paid a total of \$114,000 in dividends, and the current market price of its stock is \$76 per share. Dover Corporation had net cash flows from operations of \$271,500 and net capital expenditures of \$625,000. Calais Corporation had net cash flows from operations of \$492,500 and net capital expenditures of \$1,050,000. Information for prior years is not readily available. Assume that all notes payable are current liabilities and all bonds payable are long-term liabilities and that there is no change in inventory.

Income Statements		
	Dover	Calais
Net sales	<u>\$13,000,000</u>	<u>\$25,000,000</u>
Costs and expenses		
Cost of goods sold	\$ 6,000,000	\$14,000,000
Selling expenses	4,000,000	7,000,000
Administrative expenses	<u>1,000,000</u>	<u>3,000,000</u>
Total costs and expenses	<u>\$11,000,000</u>	<u>\$24,000,000</u>
Income from operations	\$ 2,000,000	\$ 1,000,000
Interest expense	200,000	150,000
Income before income taxes	\$ 1,800,000	\$ 850,000
Income taxes expense	<u>800,000</u>	<u>150,000</u>
Net income	<u>\$ 1,000,000</u>	<u>\$ 600,000</u>
Earnings per share	<u>\$ 10.00</u>	<u>\$ 10.00</u>

Balance Sheets		
	Dover	Calais
Assets		
Cash	\$ 80,000	\$ 180,000
Marketable securities (at cost)	200,000	20,000
Accounts receivable (net)	600,000	900,000
Inventory	700,000	1,300,000
Prepaid expenses	20,000	120,000
Property, plant, and equipment (net)	2,000,000	6,000,000
Intangibles and other assets	<u>400,000</u>	<u>480,000</u>
Total assets	<u>\$4,000,000</u>	<u>\$9,000,000</u>

(Continued)

	Dover	Calais
Liabilities and Stockholders' Equity		
Accounts payable	\$ 200,000	\$ 600,000
Notes payable	700,000	400,000
Income taxes payable	80,000	70,000
Bonds payable	1,000,000	2,000,000
Common stock, \$10 par value	1,000,000	600,000
Additional paid-in capital	120,000	2,330,000
Retained earnings	<u>900,000</u>	<u>3,000,000</u>
Total liabilities and stockholders' equity	<u>\$4,000,000</u>	<u>\$9,000,000</u>

Required

Conduct a comprehensive ratio analysis for each company. Compare the results. Round percentages and ratios to one decimal place, and consider changes of 0.1 or less to be indeterminate.

1. Prepare a liquidity analysis by calculating for each company the (a) current ratio, (b) quick ratio, (c) receivable turnover, (d) days' sales uncollected, (e) inventory turnover, (f) days' inventory on hand, (g) payables turnover, and (h) days' payable.
2. Prepare a profitability analysis by calculating for each company the (a) profit margin, (b) asset turnover, (c) return on assets, and (d) return on equity.
3. Prepare a long-term solvency analysis by calculating for each company the (a) debt to equity ratio and (b) interest coverage ratio.
4. Prepare a cash flow adequacy analysis by calculating for each company the (a) cash flow yield, (b) cash flows to sales, (c) cash flows to assets, and (d) free cash flow.
5. Prepare an analysis of market strength by calculating for each company the (a) price/earnings (P/E) ratio and (b) dividends yield.
6. Compare the two companies by inserting the ratio calculations from **1** through **5** in a table with the following column headings: Ratio, Name, Dover, Calais, and Company with More Favorable Ratio. Indicate in the last column which company had the more favorable ratio in each case.
7. How could the analysis be improved if information about these companies' prior years were available?

User insight ►

User insight ►

ENHANCING Your Knowledge, Skills, and Critical Thinking

LO1 Executive Compensation

C1. Executive compensation is often based on meeting certain targets for revenue growth, earnings, earnings per share, return on assets, or other performance measures. But what if performance is not living up to expectations? Some companies are simply changing the targets. For instance, **Sun Microsystems'** proxy as quoted in the *Wall Street Journal* states that "due to economic challenges experienced during the last fiscal year, our earnings per share and revenues are significantly below plan. As such, the Bonus Plan was amended to reduce the target bonus to 50% of the original plan and base the target bonus solely on the third and fourth quarters."¹⁴ Sun Microsystems was not alone. Other companies, such as **AT&T Wireless, Estee Lauder,** and **UST,** also lowered targets for executive bonuses.

Do you think it is acceptable to change the bonus targets for executives during the year if the year turns out to be not as successful as planned? What if an unexpected, world-shaking event occurs and has a negative effect on business, such as 9/11 had on the airline industry? What are three standards of comparison? Which of these might justify changing the bonus targets during the year?

L01 Using Investors' Services

C 2. Go to the website for **Moody's Investors Service**. Click on "ratings," which will show revisions of debt ratings issued by Moody's in the past few days. Choose a rating that has been upgraded or downgraded and read the short press announcement related to it. What reasons does Moody's give for the change in rating? What is Moody's assessment of the future of the company or institution? What financial performance measures are mentioned in the article? Summarize your findings and be prepared to share them in class.

L03 Analyzing the Airline Industry

C 3. Divide into groups. Assume your group is analyzing the fate of the larger airlines, such as **United** and **American**. You have the following information:

- Between 1999 and now, the long-term debt, including lease obligations, of the largest airlines more than doubled.
- The price of fuel has increased by one-third.
- Passenger loads are only now getting back to pre-9/11 levels.
- Severe price competition from discount airlines exists.

Identify the ratios that you consider most important to consider in assessing the future of the large airlines and discuss the effect of each of the above factors on the ratios. Be prepared to present all or part of your findings in class.

L03 Comparison of International Companies' Operating Cycles

C 4. Ratio analysis enables one to compare the performance of companies whose financial statements are presented in different currencies. Selected data from 2006 for two large pharmaceutical companies—one American, **Pfizer, Inc.**, and one Swiss, **Roche**—are presented next (in millions).¹⁵

	Pfizer, Inc. (U.S.)	Roche (Swiss)
Net sales	\$48,371	SF42,041
Cost of goods sold	7,640	10,616
Accounts receivable	9,392	8,960
Inventories	6,111	5,592
Accounts payable	2,019	2,213

For each company, calculate the receivable turnover, days' sales uncollected, inventory turnover, days' inventory on hand, payables turnover, and days' payable. Then determine the operating cycle and days of financing required for each company. (Accounts receivable in 2005 were \$9,103 for Pfizer and SF7,698 for Roche. Inventories in 2005 were \$5,478 for Pfizer and SF5,041 for Roche. Accounts payable in 2005 were \$2,073 for Pfizer and SF2,373 for Roche.) Prepare a memo containing your analysis of the operating cycles of these companies.

L02 L03 Effect of a One-Time Item on a Loan Decision

C 5. Apple a Day, Inc., and Unforgettable Edibles, Inc. are food catering businesses that operate in the same metropolitan area. Their customers include *Fortune* 500 companies, regional firms, and individuals. The two firms reported similar profit margins for the current year, and both base bonuses for managers on the achievement of a target profit margin and return on equity. Each firm has submitted a loan request to you, a loan officer for City National Bank. They have provided you with the following information:

	Apple a Day	Unforgettable Edibles
Net sales	\$625,348	\$717,900
Cost of goods sold	25,125	287,080
Gross margin	<u>\$400,223</u>	<u>\$430,820</u>
Operating expenses	281,300	371,565
Operating income	<u>\$118,923</u>	<u>\$ 59,255</u>
Gain on sale of real estate	—	81,923
Interest expense	<u>(9,333)</u>	<u>(15,338)</u>
Income before income taxes	\$109,590	\$125,840
Income taxes expense	25,990	29,525
Net income	<u>\$ 83,600</u>	<u>\$ 96,315</u>
Average stockholders' equity	<u>\$312,700</u>	<u>\$390,560</u>

1. Perform a vertical analysis and prepare a common-size income statement for each firm. Compute profit margin and return on equity.
2. Discuss these results, the bonus plan for management, and loan considerations. Identify the company that is the better loan risk.

L02 Cookie Company (Continuing Case)

C 6. In this segment of our continuing case, you will use the following data to analyze trends in your company's financial performance over the past five years.

Cookie Company					
Five-Year Summary of Operations and Other Related Data					
	2011	2010	2009	2008	2007
Summary of operations					
Sales	\$9,000	\$8,000	\$ 7,000	\$6,500	\$5,000
Cost of products sold	6,700	5,500	5,000	4,700	3,000
Interest expense	300	120	50	70	50
Provision for income taxes	400	380	350	230	150
Net income (before special items)	1,600	2,000	1,600	1,500	1,800
Other related data					
Dividends paid: common	46	40	35	30	20
Total assets	5,000	4,000	3,000	2,500	2,000
Total debt	2,000	1,000	500	750	500
Shareholders' equity	3,000	3,000	2,500	1,750	1,500

Prepare a trend analysis for your company using 2007 as the base year, and discuss the results. Identify important trends, state whether the trends are favorable or unfavorable, and discuss significant relationships among the trends.

APPENDIX

A

Present Value Tables

TABLE 1 Present Value of \$1 to Be Received at the End of a Given Number of Time Periods

Periods	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.893
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.797
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.712
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.636
5	0.951	0.906	0.883	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.567
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.507
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.452
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.404
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.361
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.322
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.287
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.257
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.229
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.205
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.183
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.163
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198	0.146
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.130
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164	0.116
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.104
21	0.811	0.660	0.538	0.439	0.359	0.294	0.242	0.199	0.164	0.135	0.093
22	0.803	0.647	0.522	0.422	0.342	0.278	0.226	0.184	0.150	0.123	0.083
23	0.795	0.634	0.507	0.406	0.326	0.262	0.211	0.170	0.138	0.112	0.074
24	0.788	0.622	0.492	0.390	0.310	0.247	0.197	0.158	0.126	0.102	0.066
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092	0.059
26	0.772	0.598	0.464	0.361	0.281	0.220	0.172	0.135	0.106	0.084	0.053
27	0.764	0.586	0.450	0.347	0.268	0.207	0.161	0.125	0.098	0.076	0.047
28	0.757	0.574	0.437	0.333	0.255	0.196	0.150	0.116	0.090	0.069	0.042
29	0.749	0.563	0.424	0.321	0.243	0.185	0.141	0.107	0.082	0.063	0.037
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057	0.033
40	0.672	0.453	0.307	0.208	0.142	0.097	0.067	0.046	0.032	0.022	0.011
50	0.608	0.372	0.228	0.141	0.087	0.054	0.034	0.021	0.013	0.009	0.003

TABLE 2 Present Value of \$1 Received Each Period for a Given Number of Time Periods

Periods	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.893
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.690
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.402
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.037
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.605
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.111
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.564
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	4.968
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.328
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.650
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	5.938
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.194
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.424
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.628
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	6.811
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	6.974
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.120
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.250
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.366
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.469
21	18.857	17.011	15.415	14.029	12.821	11.764	10.836	10.017	9.292	8.649	7.562
22	19.660	17.658	15.937	14.451	13.163	12.042	11.061	10.201	9.442	8.772	7.645
23	20.456	18.292	16.444	14.857	13.489	12.303	11.272	10.371	9.580	8.883	7.718
24	21.243	18.914	16.936	15.247	13.799	12.550	11.469	10.529	9.707	8.985	7.784
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	7.843
26	22.795	20.121	17.877	15.983	14.375	13.003	11.826	10.810	9.929	9.161	7.896
27	23.560	20.707	18.327	16.330	14.643	13.211	11.987	10.935	10.027	9.237	7.943
28	24.316	21.281	18.764	16.663	14.898	13.406	12.137	11.051	10.116	9.307	7.984
29	25.066	21.844	19.189	16.984	15.141	13.591	12.278	11.158	10.198	9.370	8.022
30	25.808	22.396	19.600	17.292	15.373	13.765	12.409	11.258	10.274	9.427	8.055
40	32.835	27.355	23.115	19.793	17.159	15.046	13.332	11.925	10.757	9.779	8.244
50	39.196	31.424	25.730	21.482	18.256	15.762	13.801	12.234	10.962	9.915	8.305

Table 2 is used to compute the present value of a *series of equal* annual cash flows.

Example—Table 2. Arthur Howard won a contest on January 1, 2010, in which the prize was \$30,000, payable in 15 annual installments of \$2,000 each December 31, beginning in 2010. Assuming a 9 percent interest rate, what is the present value of Howard's prize on January 1, 2010? From Table 2, the required multiplier is 8.061, and the answer is:

$$\$2,000 \times 8.061 = \$16,122$$

The factor values for Table 2 are:

$$\text{PVa Factor} = \frac{1 - (1 + r)^{-n}}{r}$$

14%	15%	16%	18%	20%	25%	30%	35%	40%	45%	50%	Periods
0.877	0.870	0.862	0.847	0.833	0.800	0.769	0.741	0.714	0.690	0.667	1
1.647	1.626	1.605	1.566	1.528	1.440	1.361	1.289	1.224	1.165	1.111	2
2.322	2.283	2.246	2.174	2.106	1.952	1.816	1.696	1.589	1.493	1.407	3
2.914	2.855	2.798	2.690	2.589	2.362	2.166	1.997	1.849	1.720	1.605	4
3.433	3.352	3.274	3.127	2.991	2.689	2.436	2.220	2.035	1.876	1.737	5
3.889	3.784	3.685	3.498	3.326	2.951	2.643	2.385	2.168	1.983	1.824	6
4.288	4.160	4.039	3.812	3.605	3.161	2.802	2.508	2.263	2.057	1.883	7
4.639	4.487	4.344	4.078	3.837	3.329	2.925	2.598	2.331	2.109	1.922	8
4.946	4.772	4.607	4.303	4.031	3.463	3.019	2.665	2.379	2.144	1.948	9
5.216	5.019	4.833	4.494	4.192	3.571	3.092	2.715	2.414	2.168	1.965	10
5.453	5.234	5.029	4.656	4.327	3.656	3.147	2.752	2.438	2.185	1.977	11
5.660	5.421	5.197	4.793	4.439	3.725	3.190	2.779	2.456	2.197	1.985	12
5.842	5.583	5.342	4.910	4.533	3.780	3.223	2.799	2.469	2.204	1.990	13
6.002	5.724	5.468	5.008	4.611	3.824	3.249	2.814	2.478	2.210	1.993	14
6.142	5.847	5.575	5.092	4.675	3.859	3.268	2.825	2.484	2.214	1.995	15
6.265	5.954	5.669	5.162	4.730	3.887	3.283	2.834	2.489	2.216	1.997	16
6.373	6.047	5.749	5.222	4.775	3.910	3.295	2.840	2.492	2.218	1.998	17
6.467	6.128	5.818	5.273	4.812	3.928	3.304	2.844	2.494	2.219	1.999	18
6.550	6.198	5.877	5.316	4.844	3.942	3.311	2.848	2.496	2.220	1.999	19
6.623	6.259	5.929	5.353	4.870	3.954	3.316	2.850	2.497	2.221	1.999	20
6.687	6.312	5.973	5.384	4.891	3.963	3.320	2.852	2.498	2.221	2.000	21
6.743	6.359	6.011	5.410	4.909	3.970	3.323	2.853	2.498	2.222	2.000	22
6.792	6.399	6.044	5.432	4.925	3.976	3.325	2.854	2.499	2.222	2.000	23
6.835	6.434	6.073	5.451	4.973	3.981	3.327	2.855	2.499	2.222	2.000	24
6.873	6.464	6.097	5.467	4.948	3.985	3.329	2.856	2.499	2.222	2.000	25
6.906	6.491	6.118	5.480	4.956	3.988	3.330	2.856	2.500	2.222	2.000	26
6.935	6.514	6.136	5.492	4.964	3.990	3.331	2.856	2.500	2.222	2.000	27
6.961	6.534	6.152	5.502	4.970	3.992	3.331	2.857	2.500	2.222	2.000	28
6.983	6.551	6.166	5.510	4.975	3.994	3.332	2.857	2.500	2.222	2.000	29
7.003	6.566	6.177	5.517	4.979	3.995	3.332	2.857	2.500	2.222	2.000	30
7.105	6.642	6.234	5.548	4.997	3.999	3.333	2.857	2.500	2.222	2.000	40
7.133	6.661	6.246	5.554	4.999	4.000	3.333	2.857	2.500	2.222	2.000	50

Table 2 is the columnar sum of Table 1. Table 2 applies to *ordinary annuities*, in which the first cash flow occurs one time period beyond the date for which the present value is computed.

An *annuity due* is a series of equal cash flows for N time periods, but the first payment occurs immediately. The present value of the first payment equals the face value of the cash flow; Table 2 then is used to measure the present value of N – 1 remaining cash flows.

Example—Table 2. Determine the present value on January 1, 2010, of 20 lease payments; each payment of \$10,000 is due on January 1, beginning in 2010. Assume an interest rate of 8 percent.

$$\begin{aligned} \text{Present Value} &= \text{Immediate Payment} + \text{Present Value of 19 Subsequent} \\ &\quad \text{Payments at 8\%} \\ &= \$10,000 + (\$10,000 \times 9.604) = \$106,040 \end{aligned}$$

ENDNOTES

Chapter 1

1. “Wal-Mart CEO Pleased with Sales,” *Fort Meyers News-Press*, January 5, 2006.
2. http://imanet.org/about_ethics_statement.asp.
3. http://walmartstores.com/FactsNews/FactSheets/click_on_link_to_The_Company_of_the_Future_Fact_Sheet.
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