

GLOBAL
EDITION



Horngren's Cost Accounting

A Managerial Emphasis

SIXTEENTH EDITION

Srikant M. Datar • Madhav V. Rajan



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A MANAGERIAL EMPHASIS

Sixteenth Edition

Global Edition

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Preface

Studying cost accounting is one of the best business investments a student can make. Why? Because success in any organization—from the smallest corner store to the largest multinational corporation—requires the use of cost accounting concepts and practices. Cost accounting provides key data to managers for planning and controlling, as well as costing products, services, and even customers. This book focuses on how cost accounting helps managers make better decisions, as cost accountants are increasingly becoming integral members of their company’s decision-making teams. In order to emphasize this prominence in decision making, we use the “different costs for different purposes” theme throughout this book. By focusing on basic concepts, analyses, uses, and procedures instead of procedures alone, we recognize cost accounting as a managerial tool for business strategy and implementation.

We also prepare students for the rewards and challenges they face in the professional cost accounting world of today and tomorrow. For example, we emphasize both the development of analytical skills such as Excel to leverage available information technology and the values and behaviors that make cost accountants effective in the workplace.

New to This Edition

Deeper Consideration of Global Issues

Businesses today have no choice but to integrate into an increasingly global ecosystem. Virtually all aspects, including supply chains, product markets, and the market for managerial talent, have become more international in their outlook. To illustrate this, we incorporate global considerations into many of the chapters. For example, Chapter 6 describes the special challenges of budgeting in multinational companies while Chapter 23 discusses the challenges of evaluating the performance of divisions located in different countries. Chapter 22 examines the importance of transfer pricing in minimizing the tax burden faced by multinational companies. The Concepts in Action for Chapter 16 explains the importance of joint-cost allocation in creating a trade war between poultry farms in the United States and South Africa. Several new examples of management accounting applications in companies are drawn from international settings.

Increased Focus on Merchandising and Service Sectors

In keeping with the shifts in the U.S. and world economy, this edition makes great use of merchandising and service sector examples, with corresponding de-emphasis of traditional manufacturing settings. For example, Chapter 10 illustrates linear cost functions in the context of payments for cloud computing services. Chapter 20 highlights inventory management in retail organizations and uses an example based on a seller of sunglasses. Chapter 21 incorporates a running example that looks at capital budgeting in the context of a transportation company. Several Concepts in Action boxes focus on the merchandising and service sectors, including achieving cost leadership at Trader Joe’s (Chapter 1), using activity-based costing to reduce the costs of health care delivery at the Mayo Clinic (Chapter 5), reducing fixed costs at Twitter (Chapter 2), and analyzing operating income performance at Best Buy (Chapter 12) and web-based budgeting at 24 Hour Fitness (Chapter 6).

Greater Emphasis on Sustainability

This edition places significant emphasis on sustainability as one of the critical managerial challenges of the coming decades. Many managers are promoting the development and implementation of strategies to achieve long-term financial, social, and environmental performance as key imperatives. We highlight this in Chapter 1 and return to the theme in several

subsequent chapters. Chapter 12 discusses the benefits to companies from measuring social and environmental performance and how such measures can be incorporated in a balanced scorecard. Chapter 23 provides several examples of companies that mandate disclosures and evaluate managers on environmental and social metrics. A variety of chapters, including Chapters 2, 4, 6, 10, 13, 15, and 21, contain material that stress themes of recognizing and accounting for environmental costs, energy independence and the smart grid, setting stretch targets to motivate greater carbon reductions, using cost analysis, carbon tax, and cap-and-trade auctions to reduce environmental footprints, and constructing “green” homes in a cost-effective manner.

Focus on Innovation

We discuss the role of accounting concepts and systems in fostering and supporting innovation and entrepreneurial activities in firms. In particular, we discuss the challenges posed by recognizing R&D costs as period expenses even though the benefits of innovation accrue in later periods. In Chapter 6, we describe how companies budget for innovation expenses and develop measures to monitor success of the innovation efforts delinked from operational performance in the current period. Chapter 11 presents the importance of nonfinancial measures when making decisions about innovation. Chapter 13 stresses that innovation starts with understanding customer needs while Chapter 19 discusses process innovations for improving quality.

New Cutting-Edge Topics

The pace of change in organizations continues to be rapid. The sixteenth edition of *Cost Accounting* reflects changes occurring in the role of cost accounting in organizations.

- We have introduced sustainability strategies and the methods companies use to implement sustainability and business goals.
- We describe ideas based on academic research regarding the weights to be placed on performance measures in a balanced scorecard. We have also added a new section on methods to evaluate strategy maps such as the strength of links, differentiators, focal points, and trigger points.
- We have provided details on the transfer pricing strategies used by multinational technology firms such as Apple and Google to minimize income taxes.
- We discuss current trends in the regulation of executive compensation.
- We describe the evolution of enterprise resource planning systems and newer simplified costing systems that practice lean accounting.
- We have added new material around recent trends in big data and data analytics in predicting costs and when making demand forecasts.

Opening Vignettes

Each chapter opens with a vignette on a company situation. The vignettes engage the reader in a business situation or dilemma, illustrating why and how the concepts in the chapter are relevant in business. For example, Chapter 2 describes how surf wear company Quiksilver was driven into bankruptcy by the relatively high proportion of fixed costs in its operations. Chapter 5 explains the use of activity-based costing by General Motors to evaluate its suppliers. Chapter 9 highlights the use of lean manufacturing by Boeing to work through its backlog of orders and reduce its inventory costs. Chapter 14 shows how Delta made changes to its frequent flyer program to reward its most profitable customers, who drive a disproportionate share of Delta’s revenues. Chapter 18 shows the impact on Honda of the rework costs associated with recalling millions of cars with defective airbags. Chapter 23 describes the misalignment between performance measurement and pay at Viacom, whose CEO has since been forced to step down.

Concepts in Action Boxes

Found in every chapter, these boxes cover real-world cost accounting issues across a variety of industries, including defense contracting, entertainment, manufacturing, retailing, and sports. New examples include:

- Cost–Volume–Profit Analysis Makes Subway’s \$5 Foot-Long Sandwiches a Success but Innovation Challenges Loom (Chapter 3)
- Can Chipotle Wrap Up Its Materials-Cost Variance Increases? (Chapter 7)
- H&M Uses Target Pricing to Bring Fast Fashion to Stores Worldwide (Chapter 13)
- Amazon Prime and Customer Profitability (Chapter 14)
- Hybrid Costing for Under Armour 3D Printed Shoes (Chapter 17)
- Netflix Works to Overcome Internet Bottlenecks (Chapter 19)

Streamlined Presentation

We continue to try to simplify and streamline our presentation of various topics to make it as easy as possible for students to learn the concepts, tools, and frameworks introduced in different chapters. We received positive feedback for the reorganization of Chapters 12 through 16 in the fifteenth edition and have maintained that order in the sixteenth edition. Chapter 13 is the first of four chapters on cost allocation. We introduce the purposes of cost allocation in Chapter 13 and discuss cost allocation for long-run product costing and pricing. Continuing the same example, Chapter 14 discusses cost allocation for customer costing. Chapter 15 builds on the Chapter 4 example to discuss cost allocation for support departments. Chapter 16 discusses joint cost allocation.

Other examples of streamlined presentations can be found in:

- Chapter 2 on the discussion of fundamental cost concepts and the managerial framework for decision making.
- Chapter 6, where the appendix ties the cash budget to the chapter example.
- Chapter 8, which has a comprehensive chart that lays out all of the variances described in Chapters 7 and 8.
- Chapter 9, which uses a single two-period example to illustrate the impact of various inventory-costing methods and denominator level choices.

Try It! Examples

Found throughout the chapter, Try It! interactive questions give students the opportunity to apply the concept they just learned. Linking in the eText will allow students to practice in Pearson MyLab Accounting[®] without interrupting their interaction with the eText.

Becker Multiple-Choice Questions

Sample problems, assignable in Pearson MyLab Accounting, provide an introduction to the CPA Exam format and an opportunity for early practice with CPA exam style questions.

Selected Chapter-by-Chapter Content Changes

Thank you for your continued support of Cost Accounting. In every new edition, we strive to update this text thoroughly. To ease your transition from the fifteenth edition, here are selected highlights of chapter changes for the sixteenth edition.

Chapter 1 has been rewritten to include greater discussion of sustainability and innovation and why these issues have become increasingly critical for managers. We discuss the challenges of planning and control for innovation and sustainability and how companies use these systems to manage these activities. We continue to emphasize the importance of ethics, values, and behaviors in improving the quality of financial reporting.

Chapter 2 has been updated and revised to make it easier for students to understand core cost concepts and to provide a framework for how cost accounting and cost management help

managers make decisions. We have added more material on environmental costs to explain how and why these costs may be missed in costing systems even though they are a part of product costs. We discuss the challenges of accounting for R&D costs and the implications for innovation.

Chapter 3 now includes greater managerial content, using examples from real companies to illustrate the value of cost–volume–profit analysis in managerial decision making. We have rewritten the section on CVP analysis in service and not-for-profit companies using the context of a management consulting firm. Chapter 4 has been revised to discuss the creation of cost pools, the level of fixed costs in a seasonal business, and the need to adjust normal costs to actual costs using end-of-accounting-year adjustments. The chapter also develops the criteria for allocating costs and relates them to real examples to highlight why managers need allocated cost information to make decisions.

Chapter 5 adds more discussion of product undercosting and overcosting and refining a costing system. The chapter example has been changed to add new material on time-driven activity-based costing (TDABC) compared to driver-rate activity-based costing. We integrate the discussion of behavioral considerations in implementing activity-based costing with the technical material in the chapter.

Chapter 6 presents material on the mismatch between costs incurred for breakthrough innovations in the annual budget and the revenues earned in that year. The chapter describes ways to delink innovation from current year operational performance by developing measures to monitor the success of innovation efforts. The chapter discusses how stretch targets motivate greater carbon reductions. We also elaborate on tradeoffs managers must make when choosing different organization structures.

In Chapter 7, the appendix on mix and yield variances, which used a one-off example, has now been recast using the same running example that winds its way through both Chapters 7 and 8. Chapter 8 provides a revised comprehensive summary of the variances in both Chapters 7 and 8 via an innovative exhibit.

Chapter 9 retains the simplified two-period integrated example of capacity choice. There is greater emphasis now on linking the impact of the choice of capacity concept to recent changes in financial reporting and tax requirements.

Chapter 10 provides an expanded description of big data and the reasons behind the explosion in data availability and analytics today. It also incorporates several examples of how companies are gathering and using large quantities of data to make better decisions.

Chapter 11 has been revised to emphasize nonfinancial factors in decisions, particularly in environmental and innovation decisions. The chapter explicitly considers how relevant cost analysis is distinct from the absorption costing method of preparing financial statements under Generally Accepted Accounting Principles (GAAP). The focus is on identifying and understanding why relevant costs and relevant revenues are important when making decisions.

Chapter 12 introduces a completely new section around evaluating strategy maps by identifying strong and weak links, differentiators, focal points, and trigger points. There is a new exhibit to present these concepts. The chapter also ties the Chipset strategy decision to the general discussion of strategy.

The new Chapter 13 makes significant revisions to the sections on target pricing and target costing, cost-plus pricing, and life-cycle budgeting. The chapter presents new material on carbon tax, cap-and-trade auctions, and the Sustainability Accounting Standards Board (SASB). New examples have been added when discussing predatory pricing, dumping, and collusive pricing.

Chapter 14 was completely rewritten in the fifteenth edition. The current revision makes a number of changes to improve the clarity of the writing and to motivate different concepts. The section on cost-hierarchy-based operating income has been rewritten and the section on fully allocated customer profitability has been streamlined.

Chapter 15 was also heavily revised in the fifteenth edition. The current revision makes several significant changes to clarify concepts and improve exposition. The sections on single-rate and dual-rate methods, budgeted versus actual costs, and the choice of allocation bases have all been substantially rewritten. The Concepts in Action box uses updated federal cases on contract disputes centered around cost allocation.

Chapter 16 provides a discussion of the rationale for joint-cost allocation and the merits and demerits of various joint-cost allocation methods. It includes a new opening vignette and a new real-world example to highlight the controversies that can result from using inappropriate methods of joint-cost allocation.

Chapters 17 and 18 provide a managerial lens on the estimation of equivalent units and the choice between the FIFO and weighted-average costing methods, both in the chapter content and in the new vignettes and real-world examples. The exhibits have been reformatted to make clear how various components are added to get the total costs. Chapter 18 emphasizes, with illustrative examples, the theme of striving for zero waste and a sustainable environment.

Chapter 19 focuses on quality and time. The sections on control charts, weighing the costs and benefits of improving quality, and evaluating a company's quality performance have been rewritten. This revision also makes major changes to and reorganizes the section on bottlenecks and time drivers.

Chapter 20 emphasizes the importance of choosing the correct products to sell, deeply understanding customers, and pricing smartly as ways to manage inventory. It discusses the role of big data and better demand forecasts in reducing demand uncertainty and safety stocks and in implementing materials requirements planning (MRP) systems. The section on the cost of a prediction error has been revised to link to Exhibit 20-1. The section on lean accounting has been rewritten and simplified.

Chapter 21 focuses on the role of capital budgeting in supporting the choice of sustainable long-term projects. The new opening vignette looks at the financing of residential solar panels, the integrated example deals with the purchase of a new hybrid-engine bus, and various examples throughout the chapter and in the new Concepts in Action illustrate how companies incorporate sustainability in their capital budgeting decisions.

Chapter 22 has been revised to reflect the most recent developments in the controversial use of transfer prices for tax minimization by multinational corporations, with several real-world examples. The revision also highlights the changing regulatory environment across the world and provides updated information on the use of tools such as advance pricing agreements.

Chapter 23 describes the use of environmental, social, and ethical objectives by companies as part of top management's pay structures, with new examples of companies that embed sustainability targets into compensation systems. It discusses the latest SEC regulations on disclosure of executive compensation and the impact of Dodd-Frank "say on pay" rules.

Hallmark Features of *Cost Accounting*

- Exceptionally strong emphasis on managerial uses of cost information
- Clarity and understandability of the text
- Excellent balance in integrating modern topics with traditional coverage
- Emphasis on human behavior aspects
- Extensive use of real-world examples
- Ability to teach chapters in different sequences
- Excellent quantity, quality, and range of assignment material

The first thirteen chapters provide the essence of a one-term (quarter or semester) course. There is ample text and assignment material in the book's twenty-three chapters for a two-term course. This book can be used immediately after the student has had an introductory course in financial accounting. Alternatively, this book can build on an introductory course in managerial accounting.

Deciding on the sequence of chapters in a textbook is a challenge. Because every instructor has a unique way of organizing his or her course, we utilize a modular, flexible organization that permits a course to be custom tailored. *This organization facilitates diverse approaches to teaching and learning.*

As an example of the book's flexibility, consider our treatment of process costing. Process costing is described in Chapters 17 and 18. Instructors interested in filling out a student's

perspective of costing systems can move directly from job-order costing described in Chapter 4 to Chapter 17 without interruption in the flow of material. Other instructors may want their students to delve into activity-based costing and budgeting and more decision-oriented topics early in the course. These instructors may prefer to postpone discussion of process costing.

Resources

In addition to this textbook and Pearson MyLab Accounting, a companion website is available for students at www.pearsonglobaleditions.com/Horngren.

The following resources are available for instructors in Pearson MyLab Accounting and on the Instructors Resource Center at www.pearsonglobaleditions.com/Horngren.

- Solutions Manual
- Test Bank in Word and TestGen, including algorithmic questions
- Instructors Manual
- PowerPoint Presentations
- Image Library

Acknowledgments

We are indebted to many people for their ideas and assistance. Our primary thanks go to the many academics and practitioners who have advanced our knowledge of cost accounting. The package of teaching materials we present is the work of skillful and valued team members developing some excellent end-of-chapter assignment material. Tommy Goodwin provided outstanding research assistance on technical issues and current developments. We would also like to thank the dedicated and hard-working supplement author team and Integra. The book is much better because of the efforts of these colleagues.

In shaping this edition and past editions we would like to thank all the reviewers and colleagues who have worked closely with us and the editorial team.

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Appreciation also goes to the American Institute of Certified Public Accountants, the Institute of Management Accountants, the Society of Management Accountants of Canada, the Certified General Accountants Association of Canada, the Financial Executive Institute of America, and many other publishers and companies for their generous permission to quote from their publications. Problems from the Uniform CPA examinations are designated (CPA); problems from the Certified Management Accountant examination are designated (CMA); problems from the Canadian examinations administered by the Society of Management Accountants are designated (SMA); and problems from the Certified General Accountants Association are designated (CGA). Many of these problems are adapted to highlight particular points. We are grateful to the professors who contributed assignment material for this edition. Their names are indicated in parentheses at the start of their specific problems. Comments from users are welcome.

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In memory of Charles T. Horngren 1926–2011

Chuck Horngren revolutionized cost and management accounting. He loved new ideas and introduced many new concepts. He had the unique gift of explaining these concepts in simple and creative ways. He epitomized excellence and never tired of details, whether it was finding exactly the right word or working and reworking assignment materials.

He combined his great intellect with genuine humility and warmth and a human touch that inspired others to do their best. He taught us many lessons about life through his amazing discipline, his ability to make everyone feel welcome, and his love of family.

It was a great privilege, pleasure, and honor to have known Chuck Horngren. Few individuals will have the enormous influence that Chuck had on the accounting profession. Fewer still will be able to do it with the class and style that was his hallmark. He was unique, special, and amazing in many, many ways and, at once, a role model, teacher, mentor, and friend. He will be deeply missed.

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To Our Families

Swati, Radhika, Gayatri, Sidharth (SD)
Gayathri, Sanjana, Anupama (MVR)

The Manager and Management Accounting

1

All businesses are concerned about revenues and costs.

Managers at companies small and large must understand how revenues and costs behave or risk losing control of the performance of their firms. Managers use cost accounting information to make decisions about research and development, production planning, budgeting, pricing, and the products or services to offer customers. Sometimes these decisions involve tradeoffs. The following article shows how understanding costs and pricing helps companies like Coca-Cola increase profits even as the quantity of products sold decreases.

FOR COCA-COLA, SMALLER SIZES MEAN BIGGER PROFITS

Can selling less of something be more profitable than selling more of it? As consumers become more health conscious, they are buying less soda. “Don’t want to drink too much?” Get a smaller can. “Don’t want so many calories?” Buy a smaller can. “Don’t want so much sugar?” Just drink a smaller can. In 2015, while overall sales of soda in the United States declined in terms of volume, industry revenue was higher. How, you ask? Soda companies are charging more for less!

Coca-Cola has been the market leader in selling smaller sizes of soda to consumers. Sales of smaller packages of Coca-Cola—including 8-packs of 12-ounce bottles and 7.5-ounce cans—rose 15% in 2015. Meanwhile, sales of larger bottles and cans fell. The price per ounce of Coke sold in smaller cans is higher than the price per ounce of Coke sold in bulk. The resulting higher profits from the sales of smaller sizes of soda made up for the decrease in total volume of soda sold. If these trends toward buying smaller cans continue, Coca-Cola will be selling less soda, but making more money, for years to come.

By studying cost accounting, you will learn how successful managers and accountants run their businesses and prepare yourself for leadership roles in the firms you work for. Many large companies, including Nike and the Pittsburgh Steelers, have senior executives with accounting backgrounds.

LEARNING OBJECTIVES

- 1 Distinguish financial accounting from management accounting
- 2 Understand how management accountants help firms make strategic decisions
- 3 Describe the set of business functions in the value chain and identify the dimensions of performance that customers are expecting of companies
- 4 Explain the five-step decision-making process and its role in management accounting
- 5 Describe three guidelines management accountants follow in supporting managers
- 6 Understand how management accounting fits into an organization’s structure
- 7 Understand what professional ethics mean to management accountants



urbanbuzz/Alamy Stock Photo

Sources: Mike Esterl, “Smaller Sizes Add Pop to Soda Sales,” *The Wall Street Journal*, January 27, 2016 (<http://www.wsj.com/articles/smaller-sizes-add-pop-to-soda-sales-1453890601>); Trefis, “How Coke Is Making the Most Out of Falling Soda Volumes,” January 5, 2016 (<http://www.trefis.com/stock/ko/articles/327882/how-coke-is-making-the-most-out-of-falling-soda-volumes/2016-01-05>).

Financial Accounting, Management Accounting, and Cost Accounting

LEARNING OBJECTIVE

1

Distinguish financial accounting

...reporting on past performance to external users

from management accounting

...helping managers make decisions

As many of you have already learned in your financial accounting class, accounting systems are used to record economic events and transactions, such as sales and materials purchases, and process the data into information helpful to managers, sales representatives, production supervisors, and others. Processing any economic transaction means collecting, categorizing, summarizing, and analyzing. For example, costs are collected by category, such as materials, labor, and shipping. These costs are then summarized to determine a firm's total costs by month, quarter, or year. Accountants analyze the results and together with managers evaluate, say, how costs have changed relative to revenues from one period to the next. Accounting systems also provide the information found in a firm's income statement, balance sheet, statement of cash flow, and performance reports, such as the cost of serving customers or running an advertising campaign. Managers use this information to make decisions about the activities, businesses, or functional areas they oversee. For example, a report that shows an increase in sales of laptops and iPads at an Apple store may prompt Apple to hire more salespeople at that location. Understanding accounting information is essential for managers to do their jobs.

Individual managers often require the information in an accounting system to be presented or reported differently. Consider, for example, sales order information. A sales manager at Porsche may be interested in the total dollar amount of sales to determine the commissions paid to salespeople. A distribution manager at Porsche may be interested in the sales order quantities by geographic region and by customer-requested delivery dates to ensure vehicles get delivered to customers on time. A manufacturing manager at Porsche may be interested in the quantities of various products and their desired delivery dates so that he or she can develop an effective production schedule.

To simultaneously serve the needs of all three managers, Porsche creates a database, sometimes called a data warehouse or infobarn, consisting of small, detailed bits of information that can be used for multiple purposes. For instance, the sales order database will contain detailed information about a product, its selling price, quantity ordered, and delivery details (place and date) for each sales order. The database stores information in a way that allows different managers to access the information they need. Many companies are building their own enterprise resource planning (ERP) systems. An ERP system is a single database that collects data and feeds them into applications that support a company's business activities, such as purchasing, production, distribution, and sales.

Financial accounting and management accounting have different goals. As you know, **financial accounting** focuses on reporting financial information to external parties such as investors, government agencies, banks, and suppliers based on Generally Accepted Accounting Principles (GAAP). The most important way financial accounting information affects managers' decisions and actions is through compensation, which is often, in part, based on numbers in financial statements.

Management accounting is the process of measuring, analyzing, and reporting financial and nonfinancial information that helps managers make decisions to fulfill the goals of an organization. Managers use management accounting information to:

1. develop, communicate, and implement strategies,
2. coordinate product design, production, and marketing decisions and evaluate a company's performance.

Management accounting information and reports do not have to follow set principles or rules. The key questions are always (1) how will this information help managers do their jobs better, and (2) do the benefits of producing this information exceed the costs?

Exhibit 1-1 summarizes the major differences between management accounting and financial accounting. Note, however, that reports such as balance sheets, income statements, and statements of cash flows are common to both management accounting and financial accounting.

Cost accounting provides information for both management accounting and financial accounting professionals. **Cost accounting** is the process of measuring, analyzing, and reporting financial and nonfinancial information related to the costs of acquiring or using

EXHIBIT 1-1**Major Differences Between Management and Financial Accounting**

	Management Accounting	Financial Accounting
Purpose of information	Help managers make decisions to fulfill an organization's goals	Communicate an organization's financial position to investors, banks, regulators, and other outside parties
Primary users	Managers of the organization	External users such as investors, banks, regulators, and suppliers
Focus and emphasis	Future-oriented (budget for 2017 prepared in 2016)	Past-oriented (reports on 2016 performance prepared in 2017)
Rules of measurement and reporting	Internal measures and reports do not have to follow GAAP but are based on cost-benefit analyses	Financial statements must be prepared in accordance with GAAP and be certified by external, independent auditors
Time span and type of reports	Varies from hourly information to 15 to 20 years, with financial and nonfinancial reports on products, departments, territories, and strategies	Annual and quarterly financial reports, primarily on the company as a whole
Behavioral implications	Designed to influence the behavior of managers and other employees	Primarily reports economic events but also influences behavior because manager's compensation is often based on reported financial results

resources in an organization. For example, calculating the cost of a product is a cost accounting function that meets both the financial accountant's inventory-valuation needs and the management accountant's decision-making needs (such as deciding how to price products and choosing which products to promote). However, today most accounting professionals take the perspective that cost information is part of the management accounting information collected to make management decisions. Thus, the distinction between management accounting and cost accounting is not so clear-cut, and we often use these terms interchangeably in the book.

Businesspeople frequently use the term *cost management*. Unfortunately, the term does not have an exact definition. In this book we use **cost management** to describe the activities managers undertake to use resources in a way that increases a product's value to customers and achieves an organization's goals. In other words, cost management is not only about reducing costs. Cost management also includes making decisions to incur additional costs—for example, to improve customer satisfaction and quality and to develop new products—with the goal of enhancing revenues and profits. Whether or not to enter new markets, implement new organizational processes, and change product designs are also cost management decisions. Information from accounting systems helps managers to manage costs, but the information and the accounting systems themselves are not cost management.

Strategic Decisions and the Management Accountant

A company's **strategy** specifies how the organization matches its own capabilities with the opportunities in the marketplace. In other words, strategy describes how an organization creates value for its customers while distinguishing itself from its competitors. Businesses follow one of two broad strategies. Some companies, such as Southwest

DECISION POINT

How is financial accounting different from management accounting?

LEARNING OBJECTIVE 2

Understand how management accountants help firms make strategic decisions

... they provide information about the sources of competitive advantage

Airlines and Vanguard (the mutual fund company), follow a cost leadership strategy. They profit and grow by providing quality products or services at low prices and by judiciously managing their costs. Other companies such as Apple and the pharmaceutical giant Johnson & Johnson follow a product differentiation strategy. They generate profits and growth by offering differentiated or unique products or services that appeal to their customers and are often priced higher than the less-popular products or services of their competitors.

Deciding between these strategies is a critical part of what managers do. Management accountants work closely with managers in various departments to formulate strategies by providing information about the sources of competitive advantage, such as (1) the company's cost, productivity, or efficiency advantage relative to competitors or (2) the premium prices a company can charge over its costs from distinctive product or service features. **Strategic cost management** describes cost management that specifically focuses on strategic issues.

Management accounting information helps managers formulate strategy by answering questions such as the following:

- *Who are our most important customers, and what critical capability do we have to be competitive and deliver value to our customers?* After Amazon.com's success selling books online, management accountants at Barnes & Noble outlined the costs and benefits of several alternative approaches for enhancing the company's information technology infrastructure and developing the capability to sell books online. A similar cost-benefit analysis led Toyota to build flexible computer-integrated manufacturing plants that enable it to use the same equipment efficiently to produce a variety of cars in response to changing customer tastes.
- *What is the bargaining power of our customers?* Kellogg Company, for example, uses the reputation of its brand to reduce the bargaining power of its customers and charge higher prices for its cereals.
- *What is the bargaining power of our suppliers?* Management accountants at Dell Computers consider the significant bargaining power of Intel, its supplier of microprocessors, and Microsoft, its supplier of operating system software, when considering how much it must pay to acquire these products.
- *What substitute products exist in the marketplace, and how do they differ from our product in terms of features, price, cost, and quality?* Hewlett-Packard, for example, designs, costs, and prices new printers after comparing the functionality and quality of its printers to other printers available in the marketplace.
- *Will adequate cash be available to fund the strategy, or will additional funds need to be raised?* Procter & Gamble, for example, issued new debt and equity to fund its strategic acquisition of Gillette, a maker of shaving products.

The best-designed strategies and the best-developed capabilities are useless unless they are effectively executed. In the next section, we describe how management accountants help managers take actions that create value for their customers.

DECISION POINT

How do management accountants support strategic decisions?

LEARNING OBJECTIVE 3

Describe the set of business functions in the value chain and identify the dimensions of performance that customers are expecting of companies

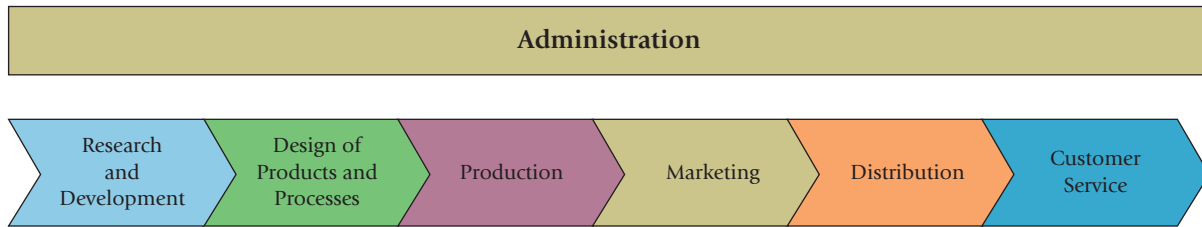
...R&D, design, production, marketing, distribution, and customer service supported by administration to achieve cost and efficiency, quality, time, and innovation

Value-Chain and Supply-Chain Analysis and Key Success Factors

Customers demand much more than just a fair price; they expect quality products (goods or services) delivered in a timely way. The entire customer experience determines the value a customer derives from a product. In this section, we explore how a company goes about creating this value.

Value-Chain Analysis

The **value chain** is the sequence of business functions by which a product is made progressively more useful to customers. Exhibit 1-2 shows six primary business functions: research

EXHIBIT 1-2 Different Parts of the Value Chain

and development (R&D), design of products and processes, production, marketing, distribution, and customer service. We illustrate these business functions with Sony Corporation's television division.

1. **Research and development (R&D)**—generating and experimenting with ideas related to new products, services, or processes. At Sony, this function includes research on alternative television signal transmission and on the picture quality of different shapes and thicknesses of television screens.
2. **Design of products and processes**—detailed planning, engineering, and testing of products and processes. Design at Sony includes deciding on the component parts in a television set and determining the effect alternative product designs will have on the set's quality and manufacturing costs. Some representations of the value chain collectively refer to the first two steps as technology development.¹
3. **Production**—procuring, transporting, and storing (“inbound logistics”) and coordinating and assembling (“operations”) resources to produce a product or deliver a service. The production of a Sony television set includes the procurement and assembly of the electronic parts, the screen and the packaging used for shipping.
4. **Marketing (including sales)**—promoting and selling products or services to customers or prospective customers. Sony markets its televisions at tradeshow, via advertisements in newspapers and magazines, on the Internet, and through its sales force.
5. **Distribution**—processing orders and shipping products or services to customers (“outbound logistics”). Distribution for Sony includes shipping to retail outlets, catalog vendors, direct sales via the Internet, and other channels through which customers purchase new televisions.
6. **Customer service**—providing after-sales service to customers. Sony provides customer service on its televisions in the form of customer-help telephone lines, support on the Internet, and warranty repair work.

In addition to the six primary business functions, Exhibit 1-2 shows an administration function, which includes accounting and finance, human resource management, and information technology and supports the six primary business functions. When discussing the value chain in subsequent chapters of the book, we include the administration function within the primary functions. For example, included in the marketing function is the function of analyzing, reporting, and accounting for resources spent in different marketing channels, whereas the production function includes the human resource management function of training frontline workers. Each of these business functions is essential to companies satisfying their customers and keeping them satisfied (and loyal) over time.

To implement their corporate strategies, companies such as Sony and Procter & Gamble use **customer relationship management (CRM)**, a strategy that integrates people and technology in all business functions to deepen relationships with customers, partners, and distributors. CRM initiatives use technology to coordinate all customer-facing activities (such

¹ M. Porter, *Competitive Advantage* (New York: Free Press, 1998).

as marketing, sales calls, distribution, and after-sales support) and the design and production activities necessary to get products to customers.

Different companies create value in different ways. Lowe's (the home-improvement retailer) does so by focusing on cost and efficiency. Toyota Motor Company does so by focusing on quality. Fast response times at eBay create quality experiences for the online auction giant's customers, whereas innovation is primarily what creates value for the customers of the biotech company Roche. The Italian apparel company Gucci creates value for its customers through the prestige of its brand. As a result, at different times and in different industries, one or more of the value-chain functions are more critical than others. For example, a company such as Roche emphasizes R&D and the design of products and processes. In contrast, a company such as Gucci focuses on marketing, distribution, and customer service to build its brand.

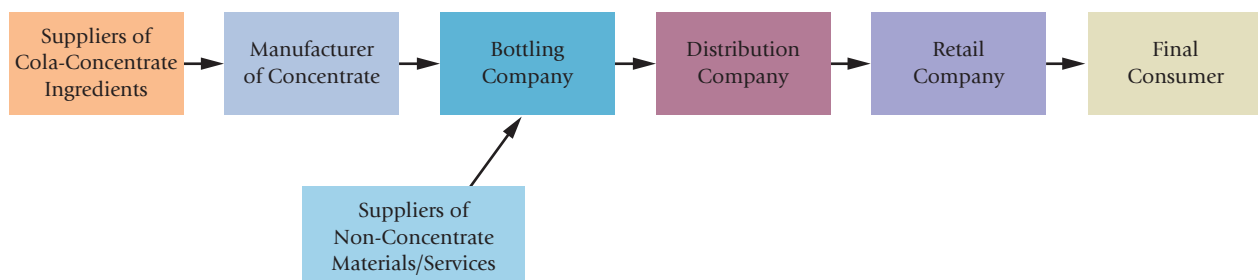
Exhibit 1-2 depicts the usual order in which different business-function activities physically occur. Do not, however, interpret Exhibit 1-2 to mean that managers should proceed sequentially through the value chain when planning and managing their activities. Companies gain (in terms of cost, quality, and the speed with which new products are developed) if two or more of the individual business functions of the value chain work concurrently as a team. For example, a company's production, marketing, distribution, and customer service personnel can often reduce a company's total costs by providing input for design decisions.

Managers track costs incurred in each value-chain category. Their goal is to reduce costs to improve efficiency or to spend more money to generate even greater revenues. Management accounting information helps managers make cost-benefit tradeoffs. For example, is it cheaper to buy products from a vendor or produce them in-house? How does investing resources in design and manufacturing increase revenues or reduce costs of marketing and customer service?

Supply-Chain Analysis

The parts of the value chain associated with producing and delivering a product or service—production and distribution—are referred to as the *supply chain*. The **supply chain** describes the flow of goods, services, and information from the initial sources of materials and services to the delivery of products to consumers, regardless of whether those activities occur in one organization or in multiple organizations. Consider Coke and Pepsi: Many companies play a role in bringing these products to consumers as the supply chain in Exhibit 1-3 shows. Part of cost management emphasizes integrating and coordinating activities across all companies in the supply chain to improve performance and reduce costs. For example, to reduce materials-handling costs, both the Coca-Cola Company and Pepsi Bottling Group require their suppliers (such as plastic and aluminum companies and sugar refiners) to frequently deliver small quantities of materials directly to their production floors. Similarly, to reduce inventory levels in the supply chain, Walmart requires its suppliers, such as Coca-Cola, to directly manage its inventory of products to ensure the right amount of them are in its stores at all times.

EXHIBIT 1-3 Supply Chain for a Cola Bottling Company



Key Success Factors

Customers want companies to use the value chain and supply chain to deliver ever-improving levels of performance when it comes to several (or even all) of the following:

- **Cost and efficiency**—Companies face continuous pressure to reduce the cost of the products they sell. To calculate and manage the cost of products, managers must first understand the activities (such as setting up machines or distributing products) that cause costs to arise as well as monitor the marketplace to determine the prices customers are willing to pay for the products. Management accounting information helps managers calculate a target cost for a product by subtracting from the “target price” the operating income per unit of product that the company wants to earn. To achieve the target cost, managers eliminate some activities (such as rework) and reduce the costs of performing other activities in all value-chain functions—from initial R&D to customer service (see Concepts in Action: Trader Joe’s Recipe for Cost Leadership). Many U.S. companies have cut costs by outsourcing some of their business functions. Nike, for example, has moved its manufacturing operations to China and Mexico, and Microsoft and IBM are increasingly doing their software development in Spain, Eastern Europe, and India.
- **Quality**—Customers expect high levels of quality. **Total quality management (TQM)** is an integrative philosophy of management for continuously improving the quality of products and processes. Managers who implement TQM believe that every person in the value chain is responsible for delivering products and services that exceed customers’ expectations. Using TQM, companies design products or services to meet customer needs and wants, to make these products with zero (or very few) defects and waste, and to minimize inventories. Managers use management accounting information to evaluate the costs and revenue benefits of TQM initiatives.
- **Time**—Time has many dimensions. Two of the most important dimensions are new-product development time and customer-response time. New-product development time is the time it takes for companies to create new products and bring them to market. The increasing pace of technological innovation has led to shorter product life cycles and more rapid introduction of new products. To make new-product development decisions, managers need to understand the costs and benefits of a product over its life cycle, including the time and cost of developing new products.

Customer-response time describes the speed at which an organization responds to customer requests. To increase the satisfaction of their customers, organizations need to meet their promised delivery dates as well as reduce their delivery times. Bottlenecks are the primary cause of delays. For example, a bottleneck can occur when the work to be performed on a machine exceeds its available capacity. To deliver the product on time, managers need to increase the capacity of the machine to produce more output. Management accounting information can help managers quantify the costs and benefits of doing so.

- **Innovation**—A constant flow of innovative products or services is the basis for the ongoing success of a company. Many companies innovate in their strategies, business models, the services they provide, and the way they market, sell, and distribute their products. Managers rely on management accounting information to evaluate alternative R&D and investment decisions and the costs and benefits of implementing innovative business models, services, and marketing plans.
- **Sustainability**—Companies are increasingly applying the key success factors of cost and efficiency, quality, time, and innovation to promote **sustainability**—the development and implementation of strategies to achieve long-term financial, social, and environmental goals. The sustainability efforts of the Japanese copier company Ricoh include energy conservation, resource conservation, product recycling, and pollution prevention. By designing products that can be easily recycled, Ricoh simultaneously improves sustainability and the cost and quality of its products.

CONCEPTS IN ACTION

Trader Joe's Recipe for Cost Leadership



BirchTree/Alamy Stock Photo

Trader Joe's has a special recipe for cost leadership: delivering unique products at reasonable prices. The grocery store chain stocks its shelves with low-cost, high-end staples (cage-free eggs and sustainably harvested seafood) and affordable luxuries (Speculoos cookie butter and Sriracha and roasted garlic BBQ sauce) that are distinct from what traditional supermarkets offer. Trader Joe's can offer these items at everyday low prices by judiciously managing its costs.

At Trader Joe's, customers swap selection for value. The company has relatively small stores with a carefully selected, constantly changing mix of items. While typical grocery stores carry 50,000 items, Trader Joe's sells only about 4,000 items. In recent years, it removed nonsustainable items from its shelves, including genetically modified items. About 80% of

the stock bears the Trader Joe's brand, and management seeks to minimize costs of these items. The company purchases directly from manufacturers, which ship their items straight to Trader Joe's warehouses to avoid third-party distribution costs. With small stores and limited storage space, Trader Joe's trucks leave the warehouse centers daily. This encourages precise, just-in-time ordering and a relentless focus on frequent merchandise turnover.

This winning combination of quality products and low prices has turned Trader Joe's into one of the hottest retailers in the United States. Its stores sell an estimated \$13 billion annually, or \$1,734 in merchandise per square foot, which is nearly double Whole Foods, its top competitor.

Sources: Beth Kowitz, "Inside the Secret World of Trader Joe's," *Fortune*, August 23, 2010 (http://archive.fortune.com/2010/08/20/news/companies/inside_trader_joes_full_version.fortune/index.htm); Christopher Palmeri, "Trader Joe's Recipe for Success," *Bloomberg Businessweek*, February 21, 2008 (<http://www.bloomberg.com/bw/stories/2008-02-20/trader-joes-recipe-for-success>); Alessandra Ran, "Teach Us, Trader Joe: Demanding Socially Responsible Food," *The Atlantic*, August 7, 2012 (<http://www.theatlantic.com/health/archive/2012/08/teach-us-trader-joe-demanding-socially-responsible-food/260786/>); Aaron Ahlburn and Keisha McDonough, "Retail ShopTopic," *Retail Research*, September 2014, Jones Lang LaSalle, Inc. (<http://www.us.jll.com/united-states/en-us/Research/JLL-ShopTopic-Grocery-share.pdf>); "Trader Joe's Customer Choice Award Winners," Trader Joe's Co. press release, Monrovia, CA: January 4, 2016 (<http://www.traderjoes.com/digin/post/trader-joes-customer-choice-award-winners>).

The interest in sustainability appears to be intensifying among companies. General Electric, Poland Springs (a bottled-water manufacturer), and Hewlett-Packard are among the many companies incorporating sustainability into their decision making. Sustainability is important to these companies for several reasons:

- More and more investors care about sustainability. These investors make investment decisions based on a company's financial, social, and environmental performance and raise questions about sustainability at shareholder meetings.
- Companies that emphasize sustainability find that sustainability goals attract and inspire employees.
- Customers prefer the products of companies with good sustainability records and boycott companies with poor sustainability records.
- Society and activist nongovernmental organizations, in particular, monitor the sustainability performance of firms and take legal action against those that violate environmental laws. Countries with fast-growing economies, such as China and India, are now either requiring or encouraging companies to develop and report on their sustainability initiatives.

Management accountants help managers track the key success factors of their firms as well as those of their competitors. Competitive information serves as a *benchmark* managers use to continuously improve their operations. Examples of continuous improvement include Southwest Airlines' efforts to increase the number of its flights that arrive on time, eBay's efforts to improve the access its customers have to online auctions, and Lowe's efforts to

DECISION POINT

How do companies add value, and what are the dimensions of performance that customers are expecting of companies?

continuously reduce the cost of its home-improvement products. Sometimes, more fundamental changes and innovations in operations, such as redesigning a manufacturing process to reduce costs, may be necessary. To successfully implement their strategies, firms have to do more than analyze their value chains and supply chains and execute key success factors. They also have to have good decision-making processes.

Decision Making, Planning, and Control: The Five-Step Decision-Making Process

We illustrate a five-step decision-making process using the example of the *Daily News*, a newspaper in Boulder, Colorado. Subsequent chapters of the book describe how managers use this five-step decision-making process to make many different types of decisions.

The *Daily News* differentiates itself from its competitors by using (1) highly respected journalists who write well-researched news articles, (2) color to enhance attractiveness to readers and advertisers, and (3) a Web site that delivers up-to-the-minute news, interviews, and analyses. The newspaper has the following resources to deliver on this strategy: an automated, computer-integrated, state-of-the-art printing facility; a Web-based information technology infrastructure; and a distribution network that is one of the best in the newspaper industry.

To keep up with steadily increasing production costs, Naomi Crawford, manager of the *Daily News*, needs to increase the company's revenues in 2017. As she ponders what she should do in early 2017, Naomi works through the five-step decision-making process.

1. **Identify the problem and uncertainties.** Naomi has two main choices:

- a. increase the selling price of the newspaper or
- b. increase the rate per page charged to advertisers.

The key uncertainty is the effect any increase in prices or rates will have on demand. A decrease in demand could offset the price or rate increases and lead to lower rather than higher revenues. These decisions would take effect in March 2017.

2. **Obtain information.** Gathering information before making a decision helps managers gain a better understanding of uncertainties. Naomi asks her marketing manager to talk to some representative readers to gauge their reaction to an increase in the newspaper's selling price. She asks her advertising sales manager to talk to current and potential advertisers to assess demand for advertising. She also reviews the effect that past increases in the price of the newspaper had on readership. Ramon Sandoval, management accountant at the *Daily News*, presents information about the effect of past increases or decreases in advertising rates on advertising revenues. He also collects and analyzes information on advertising rates competing newspapers and other media outlets charge.
3. **Make predictions about the future.** Based on this information, Naomi makes predictions about the future. She concludes that increasing prices would upset readers and decrease readership. She has a different view about advertising rates. She expects a marketwide increase in advertising rates and believes that increasing rates will have little effect on the number of advertising pages sold.

Naomi recognizes that making predictions requires judgment. She looks for biases in her thinking. Has she correctly judged reader sentiment or is the negative publicity of a price increase overly influencing her decision making? How sure is she that competitors will increase their advertising rates? Is her thinking in this respect biased by how competitors have responded in the past? Have circumstances changed? How confident is she that her sales representatives can convince advertisers to pay higher rates? After retesting her assumptions and reviewing her thinking, Naomi feels comfortable with her predictions and judgments.

4. **Make decisions by choosing among alternatives.** When making decisions, a company's strategy serves as a vital guidepost for the many individuals in different parts of the organization making decisions at different times. Consistent strategies provide a common purpose for these disparate decisions. Only if these decisions can be aligned with its strategy will an organization achieve its goals. Without this alignment, the

LEARNING OBJECTIVE

4

Explain the five-step decision-making process

... identify the problem and uncertainties; obtain information; make predictions about the future; make decisions by choosing among alternatives; implement the decision, evaluate performance, and learn

and its role in management accounting

... planning and control of operations and activities

company's decisions will be uncoordinated, pull the organization in different directions, and produce inconsistent results.

Consistent with a product differentiation strategy, Naomi decides to increase advertising rates by 4% to \$5,200 per page in March 2017, but not increase the selling price of the newspaper. She is confident that the *Daily News's* distinctive style and Web presence will increase readership, creating value for advertisers. She communicates the new advertising rate schedule to the sales department. Ramon estimates advertising revenues of \$4,160,000 ($\$5,200 \text{ per page} \times 800 \text{ pages predicted to be sold in March 2017}$).

Steps 1 through 4 are collectively referred to as *planning*. **Planning** consists of selecting an organization's goals and strategies, predicting results under various alternative ways of achieving those goals, deciding how to attain the desired goals, and communicating the goals and how to achieve them to the entire organization. Management accountants serve as business partners in these planning activities because they understand the key success factors and what creates value.

The most important planning tool when implementing strategy is a *budget*. A **budget** is the quantitative expression of a proposed plan of action by management and is an aid to coordinating what needs to be done to execute that plan. For March 2017, the budgeted advertising revenue of the *Daily News* equals \$4,160,000. The full budget for March 2017 includes budgeted circulation revenue and the production, distribution, and customer-service costs to achieve the company's sales goals; the anticipated cash flows; and the potential financing needs. Because multiple departments help prepare the budget, personnel throughout the organization have to coordinate and communicate with one another as well as with the company's suppliers and customers.

5. **Implement the decision, evaluate performance, and learn.** Managers at the *Daily News* take action to implement and achieve the March 2017 budget. The firm's management accountants then collect information on how the company's actual performance compares to planned or budgeted performance (also referred to as scorekeeping). The information on the actual results is different from the *predecision* planning information Naomi and her staff collected in Step 2, which enabled her to better understand uncertainties, to make predictions, and to make a decision. Allowing managers to compare actual performance to budgeted performance is the *control* or *postdecision* role of information. **Control** comprises taking actions that implement the planning decisions, evaluating past performance, and providing feedback and learning to help future decision making.

Measuring actual performance informs managers how well they and their subunits are doing. Linking rewards to performance helps motivate managers. These rewards are both intrinsic (recognition for a job well done) and extrinsic (salary, bonuses, and promotions linked to performance). We discuss this in more detail in a later chapter (Chapter 23). A budget serves as much as a control tool as a planning tool. Why? Because a budget is a benchmark against which actual performance can be compared.

Consider performance evaluation at the *Daily News*. During March 2017, the newspaper sold advertising, issued invoices, and received payments. The accounting system recorded these invoices and receipts. Exhibit 1-4 shows the *Daily News's* advertising revenues for March 2017. This performance report indicates that 760 pages of advertising (40 pages fewer than

EXHIBIT 1-4

Performance Report of Advertising Revenues at the *Daily News* for March 2017

	Actual Result (1)	Budgeted Amount (2)	Difference: (Actual Result – Budgeted Amount) (3) = (1) – (2)	Difference as a Percentage of Budgeted Amount (4) = (3) ÷ (2)
Advertising pages sold	760 pages	800 pages	40 pages Unfavorable	5.0% Unfavorable
Average rate per page	\$5,080	\$5,200	\$120 Unfavorable	2.3% Unfavorable
Advertising revenues	\$3,860,800	\$4,160,000	\$299,200 Unfavorable	7.2% Unfavorable

the budgeted 800 pages) were sold. The average rate per page was \$5,080, compared with the budgeted \$5,200 rate, yielding actual advertising revenues of \$3,860,800. The actual advertising revenues were \$299,200 less than the budgeted \$4,160,000. Observe how managers use both financial and nonfinancial information, such as pages of advertising, to evaluate performance.

The performance report in Exhibit 1-4 spurs investigation and **learning**, which involves examining past performance (the control function) and systematically exploring alternative ways to make better-informed decisions and plans in the future. Learning can lead to changes in goals, strategies, the ways decision alternatives are identified, and the range of information collected when making predictions and sometimes can lead to changes in managers.

The performance report in Exhibit 1-4 would prompt the management accountant to raise several questions directing the attention of managers to problems and opportunities. Is the strategy of differentiating the *Daily News* from other newspapers attracting more readers? Did the marketing and sales department make sufficient efforts to convince advertisers that, even at the higher rate of \$5,200 per page, advertising in the *Daily News* was a good buy? Why was the actual average rate per page (\$5,080) less than the budgeted rate (\$5,200)? Did some sales representatives offer discounted rates? Did economic conditions cause the decline in advertising revenues? Are revenues falling because editorial and production standards have declined? Are more readers getting their news online?

Answers to these questions could prompt the newspaper's publisher to take subsequent actions, including, for example, adding more sales personnel, making changes in editorial policy, putting more resources into expanding its presence online and on mobile devices, getting readers to pay for online content, and selling digital advertising. Good implementation requires the marketing, editorial, and production departments to work together and coordinate their actions.

The management accountant could go further by identifying the specific advertisers that cut back or stopped advertising after the rate increase went into effect. Managers could then decide when and how sales representatives should follow up with these advertisers.

Planning and control activities must be flexible enough so that managers can seize opportunities unforeseen at the time the plan was formulated. In no case should control mean that managers cling to a plan when unfolding events (such as a sensational news story) indicate that actions not encompassed by that plan (such as spending more money to cover the story) would offer better results for the company (from higher newspaper sales).

The left side of Exhibit 1-5 provides an overview of the decision-making processes at the *Daily News*. The right side of the exhibit highlights how the management accounting system aids in decision making.

Planning and control activities get more challenging when monitoring and managing innovation and sustainability. Consider the problem of how the *Daily News* must innovate as more of its readers migrate to the Web to get their news. Now follow the five-step process we described earlier. In Step 1, the uncertainties are much greater. Will there be demand for a newspaper? Will customers look to the *Daily News* to get their information or to other sources? In Step 2, obtaining information is more difficult because there is little history that managers can comfortably rely on. Instead, managers will have to make connections across disparate data, run experiments, engage with diverse experts, and speculate to understand how the world might evolve. In Step 3, making predictions about the future will require developing different scenarios and models. In Step 4, managers will need to make decisions knowing that conditions might change in unanticipated ways that will require them to be flexible and correct course midstream. In Step 5, the learning component is critical. How have the uncertainties evolved and what do managers need to do to respond to these changing circumstances?

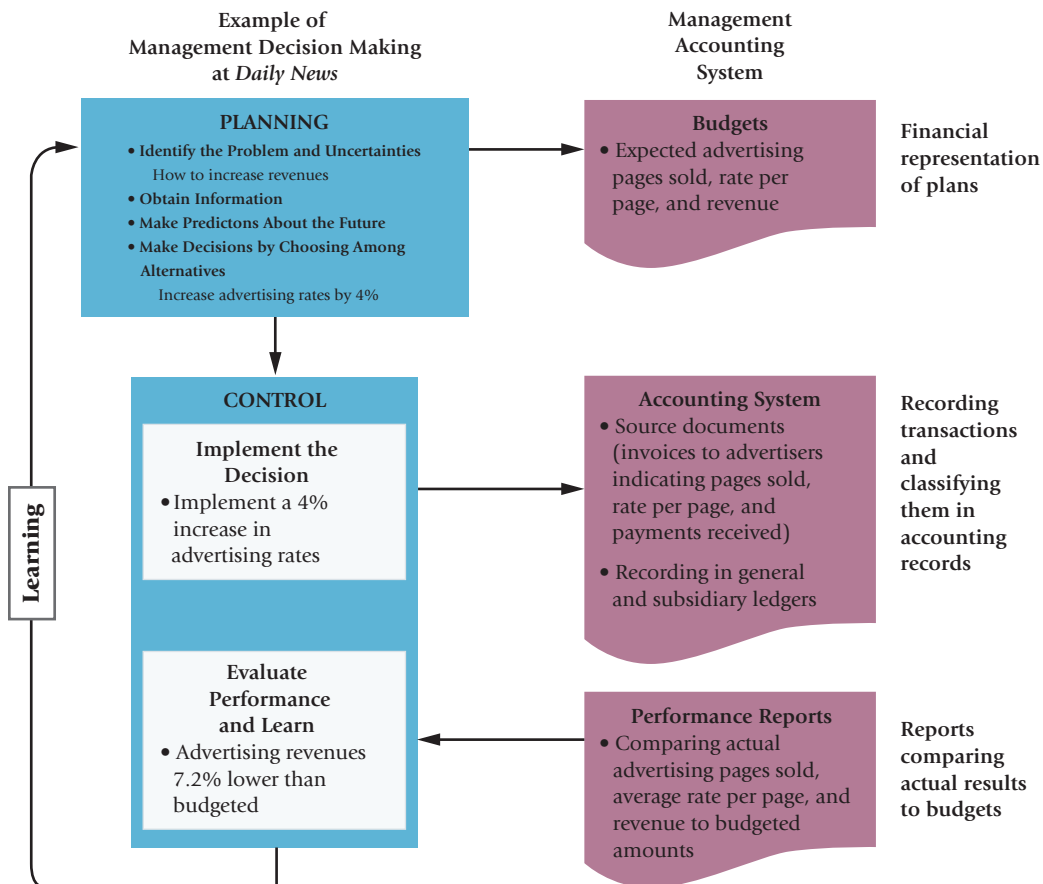
Planning and control for sustainability is equally challenging. What should the *Daily News* do about energy consumption in its printing presses, recycling of newsprint, and pollution prevention? Among the uncertainties managers face is whether customers will reward the *Daily News* for these actions by being more loyal and whether investors will react favorably to managers spending resources on sustainability. Information to gauge customer and investor sentiment is not easy to obtain. Predicting how sustainability efforts might pay off in the long run is far from certain. Even as managers make decisions, the sustainability landscape will doubtlessly change with respect to environmental regulations and societal expectations, requiring managers to learn and adapt.

DECISION POINT

How do managers make decisions to implement strategy?

EXHIBIT 1-5

How Accounting Aids Decision Making, Planning, and Control at the *Daily News*



Do these challenges of implementing planning and control systems for innovation and sustainability mean that these systems should not be used for these initiatives? No. Many companies find value in using these systems to manage innovation and sustainability. But, in keeping with the challenges described earlier, companies such as Johnson & Johnson use these systems in a different way to obtain information around key strategic uncertainties, to implement plans while being mindful that circumstances might change, and to evaluate performance in order to learn. We will return to the themes of innovation and sustainability at various points in the book.

Key Management Accounting Guidelines

LEARNING OBJECTIVE 5

Describe three guidelines management accountants follow in supporting managers

...employing a cost-benefit approach, recognizing behavioral as well as technical considerations, and calculating different costs for different purposes

Three guidelines help management accountants provide the most value to the strategic and operational decision making of their companies: (1) employ a cost-benefit approach, (2) give full recognition to behavioral and technical considerations, and (3) use different costs for different purposes.

Cost-Benefit Approach

Managers continually face resource-allocation decisions, such as whether to purchase a new software package or hire a new employee. They use a **cost-benefit approach** when making these decisions. Managers should spend resources if the expected benefits to the company exceed the expected costs. Managers rely on management accounting information to quantify expected benefits and expected costs (although all benefits and costs are not easy to quantify).

Consider the installation of a consulting company's first budgeting system. Previously, the company used historical recordkeeping and little formal planning. A major benefit of installing a budgeting system is that it compels managers to plan ahead, compare actual to

budgeted information, learn, and take corrective action. Although the system leads to better decisions and consequently better company performance, the exact benefits are not easy to measure. On the cost side, some costs, such as investments in software and training, are easier to quantify. Others, such as the time spent by managers on the budgeting process, are more difficult to quantify. Regardless, senior managers compare expected benefits and expected costs, exercise judgment, and reach a decision, in this case to install the budgeting system.

Behavioral and Technical Considerations

When utilizing the cost–benefit approach, managers need to keep in mind a number of technical and behavioral considerations. Technical considerations help managers make wise economic decisions by providing desired information (for example, costs in various value-chain categories) in an appropriate format (for example, actual results versus budgeted amounts) and at the preferred frequency (for example, weekly or quarterly). However, management is not confined to technical matters. Management is primarily a human activity that should focus on encouraging individuals to do their jobs better. Budgets have a behavioral effect by motivating and rewarding employees for achieving an organization’s goals. So, when workers underperform, for example, behavioral considerations suggest that managers need to discuss ways to improve their performance with them rather than just sending them a report highlighting their underperformance.

Different Costs for Different Purposes

This book emphasizes that managers use alternative ways to compute costs in different decision-making situations because there are different costs for different purposes. A cost concept used for the purposes of external reporting may not be appropriate for internal, routine reporting.

Consider the advertising costs associated with Microsoft Corporation’s launch of a product with a useful life of several years. For external reporting to shareholders, Generally Accepted Accounting Principles (GAAP) require television advertising costs for this product to be fully expensed in the income statement in the year they are incurred. However, for internal reporting, the television advertising costs could be capitalized and then amortized or written off as expenses over several years if Microsoft’s management team believed that doing so would more accurately and fairly measure the performance of the managers that launched the new product.

We now discuss the relationships and reporting responsibilities among managers and management accountants within a company’s organization structure.

DECISION POINT

What guidelines do management accountants use?

Organization Structure and the Management Accountant

We focus first on broad management functions and then look at how the management accounting and finance functions support managers.

Line and Staff Relationships

Organizations distinguish between line management and staff management. **Line management**, such as production, marketing, and distribution management, is directly responsible for achieving the goals of the organization. For example, managers of manufacturing divisions are responsible for meeting particular levels of budgeted operating income, product quality and safety, and compliance with environmental laws. Similarly, the pediatrics department in a hospital is responsible for quality of service, costs, and patient billings. **Staff management**, such as management accountants and information technology and human-resources management, provides advice, support, and assistance to line management. A plant manager (a line function) may be responsible for investing in new equipment. A management accountant (a staff function) works as a business partner of the plant manager by preparing detailed operating-cost comparisons of alternative pieces of equipment.

LEARNING OBJECTIVE 6

Understand how management accounting fits into an organization’s structure

...for example, the responsibilities of the controller

Increasingly, organizations such as Honda and Dell are using teams to achieve their objectives. These teams include both line and staff management so that all inputs into a decision are available simultaneously.

The Chief Financial Officer and the Controller

The **chief financial officer (CFO)**—also called the **finance director** in many countries—is the executive responsible for overseeing the financial operations of an organization. The responsibilities of the CFO vary among organizations, but they usually include the following areas:

- **Controllershship**—provides financial information for reports to managers and shareholders and oversees the overall operations of the accounting system.
- **Tax**—plans income taxes, sales taxes, and international taxes.
- **Treasury**—oversees banking and short- and long-term financing, investments, and cash management.
- **Risk management**—manages the financial risk of interest-rate and exchange-rate changes and derivatives management.
- **Investor relations**—communicates with, responds to, and interacts with shareholders.
- **Strategic planning**—defines strategy and allocates resources to implement strategy.

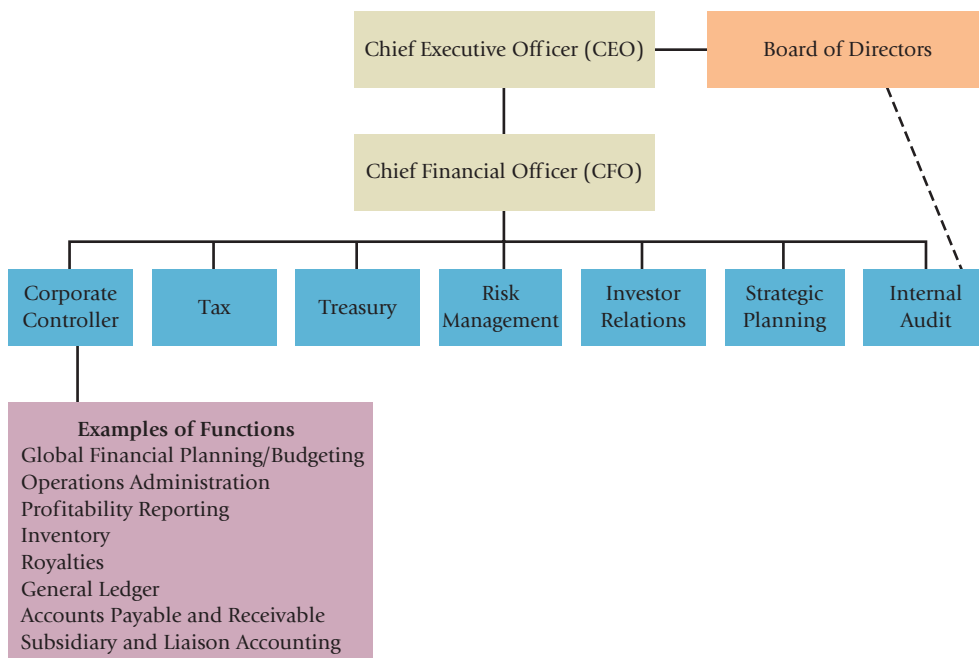
An independent internal audit function reviews and analyzes financial and other records to attest to the integrity of the organization's financial reports and to adherence to its policies and procedures.

The **controller** (also called the *chief accounting officer*) is the financial executive primarily responsible for management accounting and financial accounting. This book focuses on the controller as the chief management accounting executive. Modern controllers have no line authority except over their own departments. Yet the controller exercises control over the entire organization in a special way. By reporting and interpreting relevant data, the controller influences the behavior of all employees and helps line managers make better decisions.

Exhibit 1-6 shows an organization chart of the CFO and the corporate controller at Nike, the leading footwear and sports apparel company. The CFO is a staff manager who reports to and supports the chief executive officer (CEO). As in most organizations, the corporate controller at Nike reports to the CFO. Nike also has regional controllers who support regional managers in the major geographic regions in which the company operates, such as the United States, Asia Pacific, Latin America, and Europe. Because they support the activities of the

EXHIBIT 1-6

Nike: Reporting Relationship for the CFO and the Corporate Controller



regional manager, for example, by managing budgets and analyzing costs, regional controllers report to the regional manager rather than the corporate controller. At the same time, to align accounting policies and practices for the whole organization, regional controllers have a functional (often called a dotted-line) responsibility to the corporate controller. Individual countries sometimes have a country controller.

Organization charts such as the one in Exhibit 1-6 show formal reporting relationships. In most organizations, there also are informal relationships that must be understood when managers attempt to implement their decisions. Examples of informal relationships are friendships (both professional and personal) among managers and the preferences of top management about the managers they rely on when making decisions.

Think about what managers do to design and implement strategies and the organization structures within which they operate. Then think about the management accountants' and controllers' roles. It should be clear that the successful management accountant must have technical and analytical competence *as well as* behavioral and interpersonal skills.

Management Accounting Beyond the Numbers²

To people outside the profession, it may seem like accountants are just “numbers people.” It is true that most accountants are adept financial managers, yet their skills do not stop there. The successful management accountant possesses several skills and characteristics that reach well beyond basic analytical abilities.

Management accountants must work well in cross-functional teams and as a business partner. In addition to being technically competent, the best management accountants work well in teams, learn about business issues, understand the motivations of different individuals, respect the views of their colleagues, and show empathy and trust.

Management accountants must promote fact-based analysis and make tough-minded, critical judgments without being adversarial. Management accountants must raise tough questions for managers to consider, especially when preparing budgets. They must do so thoughtfully and with the intent of improving plans and decisions. Before the investment bank JP Morgan lost more than \$6 billion on “exotic” financial investments (credit-default swaps) in 2012, controllers should have raised questions about these risky investments and the fact that the firm was essentially betting that improving economic conditions abroad would earn it a large profit.

They must lead and motivate people to change and be innovative. Implementing new ideas, however good they may be, is difficult. When the United States Department of Defense (DoD) began consolidating more than 320 finance and accounting systems into a common platform, the accounting services director and his team of management accountants held meetings to make sure everyone in the agency understood the goal for such a change. Ultimately, the DoD aligned each individual's performance with the transformative change and introduced incentive pay to encourage personnel to adopt the platform and drive innovation within this new framework.

They must communicate clearly, openly, and candidly. Communicating information is a large part of a management accountant's job. When premium car companies such as Rolls Royce and Porsche design new models, management accountants work closely with engineers to ensure that each new car supports a carefully defined balance of commercial, engineering, and financial criteria. These efforts are successful because management accountants clearly communicate the information that multidisciplinary teams need to deliver new innovations profitably.

They must have high integrity. Management accountants must never succumb to pressure from managers to manipulate financial information. They must always remember that their primary commitment is to the organization and its shareholders. In 2015, Toshiba, the

DECISION POINT

Where does the management accounting function fit into an organization's structure?

² United States Senate Permanent Subcommittee on Investigations. *JPMorgan Chase Whale Trades: A Case History of Derivatives Risks and Abuses*. Washington, DC: Government Printing Office, March 15, 2013; Wendy Garling, “Winning the Transformation Battle at the Defense Finance and Accounting Service,” *Balanced Scorecard Report*, May–June 2007; Bill Nixon, John Burns, and Mostafa Jazayeri, *The Role of Management Accounting in New Product Design and Development Decisions*, Volume 9, Issue 1. London: Chartered Institute of Management Accountants, November 2011; and Eric Pfanner and Magumi Fujikawa, “Toshiba Slashes Earnings for Past Seven Years,” *The Wall Street Journal* (September 7, 2015).

Japanese maker of semiconductors, consumer electronics, and nuclear power plants wrote down \$1.9 billion of earnings that had been overstated over the previous seven years. The problems stemmed from managers setting aggressive profit targets that subordinates could not meet without inflating divisional results by understating costs, postponing losses, and overstating revenues.

LEARNING OBJECTIVE 7

Understand what professional ethics mean to management accountants

...for example, management accountants must maintain integrity and credibility in every aspect of their job

Professional Ethics

At no time has the focus on ethical conduct been higher than it is today. Corporate scandals at Arthur Andersen, a public accounting firm; Countrywide Financial, a home mortgage company; Enron, an oil and gas company; Lehman Brothers, an investment bank; Toshiba, a Japanese conglomerate; and Bernie Madoff Investment Securities have seriously eroded the public's confidence in corporations. All employees in a company must comply with the organization's—and more broadly, society's—expectations of ethical standards.

Ethics are the foundation of a well-functioning economy. When ethics are weak, suppliers bribe executives to win supply contracts rather than invest in improving quality or lowering costs. In the absence of ethical conduct, customers have little confidence in the quality of products produced and become reluctant to buy them, causing markets to fail. Prices of products increase because of higher prices paid to suppliers and fewer products being produced and sold. Investors are unsure about the integrity of financial reports, affecting their ability to make investment decisions, resulting in a reluctance to invest and a misallocation of resources. The scandals at Ahold, an international supermarket operator, and Tyco International, a diversified global manufacturing company, and others make clear that value is quickly destroyed by unethical behavior.

Institutional Support

Accountants have special ethical obligations, given that they are responsible for the integrity of the financial information provided to internal and external parties. The Sarbanes–Oxley legislation in the United States was passed in 2002 in response to a series of corporate scandals. The act focuses on improving internal control, corporate governance, monitoring of managers, and disclosure practices of public corporations. These regulations impose tough ethical standards and criminal penalties on managers and accountants who don't meet the standards. The regulations also delineate a process for employees to report violations of illegal and unethical acts (these employees are called whistleblowers).

As part of the Sarbanes–Oxley Act, CEOs and CFOs must certify that the financial statements of their firms fairly represent the results of their operations. In order to increase the independence of auditors, the act empowers the audit committee of a company's board of directors (which is composed exclusively of independent directors) to hire, compensate, and terminate the public accounting firm to audit a company. To reduce their financial dependency on their individual clients and increase their independence, the act limits auditing firms from providing consulting, tax, and other advisory services to the companies they are auditing. The act also authorizes the Public Company Accounting Oversight Board to oversee, review, and investigate the work of the auditors.

Professional accounting organizations, which represent management accountants in many countries, offer certification programs indicating that those who have completed them have management accounting and financial management technical knowledge and expertise. These organizations also advocate high ethical standards. In the United States, the Institute of Management Accountants (IMA) has also issued ethical guidelines. Exhibit 1-7 presents the IMA's guidance on issues relating to competence, confidentiality, integrity, and credibility. To provide support to its members to act ethically at all times, the IMA runs an ethics hotline service. Members can call professional counselors at the IMA's Ethics Counseling Service to discuss their ethical dilemmas. The counselors help identify the key ethical issues and possible alternative ways of resolving them, and confidentiality is guaranteed. The IMA is just one of many institutions that help navigate management accountants through what could be turbulent ethical waters.

EXHIBIT 1-7

Standards of
Ethical Behavior
for Practitioners
of Management
Accounting and
Financial Management

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.

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.

Source: IMA Statement of Ethical Professional Practice, 2016. Montvale, NJ: Institute of Management Accountants. Reprinted with permission from the Institute of Management Accountants, Montvale, NJ, www.imanet.org.

Typical Ethical Challenges

Ethical issues can confront management accountants in many ways. Here are two examples:

- **Case A:** A management accountant is concerned about the commercial potential of a software product for which development costs are currently being capitalized as an asset rather than being shown as an expense for internal reporting purposes. The firm's division manager, whose bonus is based, in part, on the division's profits, argues that showing development costs as an asset is justified because the new product will generate profits. However, he presents little evidence to support his argument. The last two products from the division have been unsuccessful. The management accountant wants

to make the right decision while avoiding a difficult personal confrontation with his boss, the division manager. (This case is similar to the situation at Toshiba where senior managers set aggressive divisional targets and divisional accountants inflated divisional profits to achieve them.)

- **Case B:** A packaging supplier, bidding for a new contract, offers a management accountant of the purchasing company an all-expenses-paid weekend to the Super Bowl. The supplier does not mention the new contract when extending the invitation. The management accountant is not a personal friend of the supplier. He knows cost issues are critical when it comes to approving the new contract and is concerned that the supplier will ask for details about the bids placed by competing packaging companies.

In each case, the management accountant is faced with an ethical dilemma. Ethical issues are not always clear-cut. Case A involves competence, credibility, and integrity. The management accountant should request that the division manager provide credible evidence that the new product is commercially viable. If the manager does not provide such evidence, expensing development costs in the current period is appropriate.

Case B involves confidentiality and integrity. The supplier in Case B may have no intention of asking questions about competitors' bids. However, the appearance of a conflict of interest in Case B is sufficient for many companies to prohibit employees from accepting "favors" from suppliers.

Exhibit 1-8 presents the IMA's guidance on "Resolution of Ethical Conflict." For example, if the divisional management accountant in Case A is not satisfied with the response of the division manager regarding the commercial viability of the product, he or she should discuss the issue with the corporate controller. The accountant in Case B should discuss the invitation with his or her immediate supervisor. If the visit is approved, the accountant should inform the supplier that the invitation has been officially approved subject to following corporate policy (which includes not disclosing confidential company information).

Most professional accounting organizations around the globe issue statements about professional ethics. These statements include many of the same issues discussed by the IMA in Exhibits 1-7 and 1-8. For example, the Chartered Institute of Management Accountants (CIMA) in the United Kingdom advocates five ethical principles similar to those shown in Exhibit 1-7: professional competence and due care, confidentiality, integrity, objectivity, and professional behavior.

DECISION POINT

What are the ethical responsibilities of management accountants?

EXHIBIT 1-8

Resolution of Ethical Conflict

RESOLUTION OF ETHICAL CONDUCT

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:

1. 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.
2. 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.
3. Consult your own attorney as to legal obligations and rights concerning the ethical conflict.

Source: IMA Statement of Ethical Professional Practice, 2016. Montvale, NJ: Institute of Management Accountants. Reprinted with permission from the Institute of Management Accountants, Montvale, NJ, www.imanet.org.

PROBLEM FOR SELF-STUDY

Campbell Soup Company incurs the following costs:

- a. Purchase of tomatoes by a canning plant for Campbell's tomato soup products
- b. Materials purchased for redesigning Pepperidge Farm biscuit containers to make biscuits stay fresh longer
- c. Payment to Backer, Spielvogel, & Bates, the advertising agency, for advertising work on the Healthy Request line of soup products
- d. Salaries of food technologists researching feasibility of a Prego pizza sauce that has minimal calories
- e. Payment to Safeway for redeeming coupons on Campbell's food products
- f. Cost of a toll-free telephone line used for customer inquiries about using Campbell's soup products
- g. Cost of gloves used by line operators on the Swanson Fiesta breakfast-food production line
- h. Cost of handheld computers used by Pepperidge Farm delivery staff serving major super-market accounts

Classify each cost item (a–h) as one of the business functions in the value chain in Exhibit 1-2 (page 25).

Solution

- a. Production
- b. Design of products and processes
- c. Marketing
- d. Research and development
- e. Marketing
- f. Customer service
- g. Production
- h. Distribution

DECISION POINTS

The following question-and-answer format summarizes the chapter's learning objectives. Each decision presents a key question related to a learning objective. The guidelines are the answer to that question.

Decision

1. How is financial accounting different from management accounting?
2. How do management accountants support strategic decisions?
3. How do companies add value, and what are the dimensions of performance that customers are expecting of companies?

Guidelines

Financial accounting is used to develop reports for external users on past financial performance using GAAP. Management accounting is used to provide future-oriented information to help managers (internal users) make decisions and achieve an organization's goals.

Management accountants contribute to strategic decisions by providing information about the sources of competitive advantage.

Companies add value through research and development (R&D), design of products and processes, production, marketing, distribution, and customer service. Customers want companies to deliver performance through cost and efficiency, quality, timeliness, and innovation.

Decision

- 4. How do managers make decisions to implement strategy?
- 5. What guidelines do management accountants use?
- 6. Where does the management accounting function fit into an organization’s structure?
- 7. What are the ethical responsibilities of management accountants?

Guidelines

Managers use a five-step decision-making process to implement strategy: (1) identify the problem and uncertainties; (2) obtain information; (3) make predictions about the future; (4) make decisions by choosing among alternatives; and (5) implement the decision, evaluate performance, and learn. The first four steps are planning decisions. They include deciding on an organization’s goals, predicting results under various alternative ways of achieving those goals, and deciding how to attain the desired goals. Step 5 is the control decision, which includes taking actions to implement the planning decisions, evaluating past performance, and providing feedback that will help future decision making.

Three guidelines that help management accountants increase their value to managers are (a) employing a cost–benefit approach, (b) recognizing behavioral as well as technical considerations, and (c) identifying different costs for different purposes.

Management accounting is an integral part of the controller’s function. In most organizations, the controller reports to the chief financial officer, who is a key member of the top management team.

Management accountants have ethical responsibilities that relate to competence, confidentiality, integrity, and credibility.

TERMS TO LEARN

Each chapter will include this section. Like all technical terms, accounting terms have precise meanings. Learn the definitions of new terms when you initially encounter them. The meaning of each of the following terms is given in this chapter and in the Glossary at the end of this book.

budget (p. 30)	design of products and processes (p. 25)	research and development (R&D) (p. 25)
chief financial officer (CFO) (p. 34)	distribution (p. 25)	staff management (p. 33)
control (p. 30)	finance director (p. 34)	strategic cost management (p. 24)
controller (p. 34)	financial accounting (p. 22)	strategy (p. 23)
cost accounting (p. 22)	learning (p. 31)	supply chain (p. 26)
cost–benefit approach (p. 32)	line management (p. 33)	sustainability (p. 27)
cost management (p. 23)	management accounting (p. 22)	total quality management (TQM) (p. 27)
customer relationship management (CRM) (p. 25)	marketing (p. 25)	value chain (p. 24)
customer service (p. 25)	planning (p. 30)	
	production (p. 25)	

ASSIGNMENT MATERIAL

Pearson MyLab Accounting

Questions

- 1-1 How does management accounting differ from financial accounting?
- 1-2 “Management accounting should not fit the straitjacket of financial accounting.” Explain and give an example.
- 1-3 How can management accounting information help managers formulate strategies?
- 1-4 Define the term “value chain” and state its six primary business functions.

- 1-5** Explain the term *supply chain* and its importance to cost management.
- 1-6** "Management accounting deals only with costs." Do you agree? Explain.
- 1-7** How can management accountants help improve quality and achieve timely product deliveries?
- 1-8** Describe the five-step decision-making process.
- 1-9** Distinguish planning decisions from control decisions.
- 1-10** What three guidelines help management accountants provide the most value to managers?
- 1-11** "Technical and basic analytical competence are necessary but not sufficient conditions to becoming a successful management accountant." Do you agree? Why?
- 1-12** As the new controller, reply to the following comment made by your plant manager: "When I employ a proper accounting software, which can process all my daily accounting records and provide me with all necessary reports and analyses, I am not sure what additional value our accountants will bring to the business. I know enough about my business to understand the computer-generated reports."
- 1-13** Where does the management accounting function fit into an organization's structure?
- 1-14** What is the role of ethics in a well-functioning economy? List a few groups of stakeholders who may suffer in an economic system governed by weak ethics.
- 1-15** Provide one example of an ethical issue in relation to suppliers and its possible impact on customers and the market when ethics is weak.

Multiple-Choice Questions

Pearson MyLab Accounting



- 1-16** Which of the following is not a primary function of the management accountant?
- a. Communicates financial results and position to external parties.
 - b. Uses information to develop and implement business strategy.
 - c. Aids in the decision making to help an organization meet its goals.
 - d. Provides input into an entity's production and marketing decisions.

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Exercises

1-17 Value chain and classification of costs, computer company. Compaq Computer incurs the following costs:

- a. Electricity costs for the plant assembling the Presario computer line of products
- b. Transportation costs for shipping the Presario line of products to a retail chain
- c. Payment to David Kelley Designs for design of the Armada Notebook
- d. Salary of computer scientist working on the next generation of minicomputers
- e. Cost of Compaq employees' visit to a major customer to demonstrate Compaq's ability to interconnect with other computers
- f. Purchase of competitors' products for testing against potential Compaq products
- g. Payment to television network for running Compaq advertisements
- h. Cost of cables purchased from outside supplier to be used with Compaq printers

Classify each of the cost items (a–h) into one of the business functions of the value chain shown in Exhibit 1-2 (page 25).

Required

1-18 Value chain and classification of costs, pharmaceutical company. Pfizer, a pharmaceutical company, incurs the following costs:

- a. Payment of booth registration fee at a medical conference to promote new products to physicians
- b. Cost of redesigning an insulin syringe to make it less painful
- c. Cost of a toll-free telephone line used for customer inquiries about drug usage, side effects of drugs, and so on
- d. Equipment purchased to conduct experiments on drugs yet to be approved by the government
- e. Sponsorship of a professional golfer
- f. Labor costs of workers in the packaging area of a production facility
- g. Bonus paid to a salesperson for exceeding a monthly sales quota
- h. Cost of FedEx courier service to deliver drugs to hospitals

Classify each of the cost items (a–h) as one of the business functions of the value chain shown in Exhibit 1-2 (page 25).

Required

1-19 Value chain and classification of costs, fast-food restaurant. Burger King, a hamburger fast-food restaurant, incurs the following costs:

- Cost of oil for the deep fryer
- Wages of the counter help who give customers the food they order
- Cost of the costume for the King on the Burger King television commercials
- Cost of children's toys given away free with kids' meals
- Cost of the posters indicating the special "two cheeseburgers for \$2.50"
- Costs of frozen onion rings and French fries
- Salaries of the food specialists who create new sandwiches for the restaurant chain
- Cost of "to-go" bags requested by customers who could not finish their meals in the restaurant

Required

Classify each of the cost items (a–h) as one of the business functions of the value chain shown in Exhibit 1-2 (page 25).

1-20 Key success factors. Dominion Consulting has issued a report recommending changes for its newest manufacturing client, Gibson Engine Works. Gibson currently manufactures a single product, which is sold and distributed nationally. The report contains the following suggestions for enhancing business performance:

- Develop a rechargeable electric engine to stay ahead of competitors.
- Adopt a TQM philosophy to reduce waste and defects to near zero.
- Reduce lead times (time from customer order of product to customer receipt of product) by 20% in order to increase customer retention.
- Negotiate faster response times with direct material suppliers to allow for lower material inventory levels.
- Benchmark the company's gross margin percentages against its major competitors.

Required

Link each of these changes to the key success factors that are important to managers.

1-21 Key success factors. Dalworth Construction Company provides construction services for major projects. Managers at the company believe that construction is a people-management business, and they list the following as factors critical to their success:

- Hire external consultants to implement six sigma principles in the company for sustainable quality improvement.
- Take steps to increase employee morale and motivation by applying motivational models so that overall employee productivity increases.
- Benchmark company's total costs of projects with its major competitors so that errors and wastages are minimized.
- Carry out a training need analysis of the existing employees and train them accordingly.
- Use modern tools and machineries so that cost of construction goes down and overall quality improves.

Required

Match each of these factors to the key success factors that are important to managers.

1-22 Planning and control decisions. Gregor Company makes and sells brooms and mops. It takes the following actions, not necessarily in the order given. For each action (a–e), state whether it is a planning decision or a control decision.

- Gregor asks its advertising team to develop fresh advertisements to market its newest product.
- Gregor calculates customer satisfaction scores after introducing its newest product.
- Gregor compares costs it actually incurred with costs it expected to incur for the production of the new product.
- Gregor's design team proposes a new product to compete directly with the Swiffer.
- Gregor estimates the costs it will incur to distribute 30,000 units of the new product in the first quarter of next fiscal year.

1-23 Planning and control decisions. Fred Harris is the president of United Maintenance Service. He takes the following actions, not necessarily in the order given. For each action (a–e) state whether it is a planning decision or a control decision.

- Fred contemplates procuring a digital lathe machine advised by his chief maintenance engineer.
- Fred estimates the job cost of providing maintenance service to a local factory.
- Fred calculates the total cost of materials in an annual maintenance contract to a client.
- Fred decides to expand service offerings to nearby construction companies.
- Fred makes a comparative analysis of administrative overheads with budgeted overheads.

1-24 Five-step decision-making process, manufacturing. Real's Bees makes products for personal care and sells through retail outlets and grocery stores. Its product line includes products for facial and body skin care, lip care, baby care, and outdoor remedies. The company wishes to enter into the hair care segment to make its product line stronger. The managers at Real's Bees take the following actions before taking the final decision. The actions are not listed in the order they are performed.

- a. Production managers, with the help of cost managers and research wing of the company, prepare an estimate of costs for introducing hair care products.
- b. Managers expect to grab a good market quickly by selling hair care products to the existing customers.
- c. The company decides to introduce a new hair care product rather than introduce a new variant of any existing product.
- d. Sales managers estimate they will sell more hair care products in the middle-age group.
- e. The managers feel that introduction of hair care products is necessary to cope with competitors.
- f. Incremental revenues by selling the new hair care product are budgeted.
- g. Sales managers conduct Internet research to find out the present sales growth in the hair care market.

Required

Classify each of the actions (a–g) as a step in the five-step decision-making process (identify the problem and uncertainties; obtain information; make predictions about the future; make decisions by choosing among alternatives; implement the decision, evaluate performance, and learn).

1-25 Five-step decision-making process, service firm. Brook Exteriors is a firm that provides house-painting services. Richard Brook, the owner, is trying to find new ways to increase revenues. Mr. Brook performs the following actions, not in the order listed.

- a. Mr. Brook decides to buy the paint sprayers rather than hire additional painters.
- b. Mr. Brook discusses with his employees the possibility of using paint sprayers instead of hand painting to increase productivity and thus profits.
- c. Mr. Brook learns of a large potential job that is about to go out for bids.
- d. Mr. Brook compares the expected cost of buying sprayers to the expected cost of hiring more workers who paint by hand and estimates profits from both alternatives.
- e. Mr. Brook estimates that using sprayers will reduce painting time by 20%.
- f. Mr. Brook researches the price of paint sprayers online.

Required

Classify each of the actions (a–f) according to its step in the five-step decision-making process (identify the problem and uncertainties; obtain information; make predictions about the future; make decisions by choosing among alternatives; implement the decision, evaluate performance, and learn).

1-26 Professional ethics and reporting division performance. Joshua Wilson is the controller of Apex Frame Mouldings, a division of Garman Enterprises. As the division is preparing to count year-end inventory, Wilson is approached by Doug Leonard, the division's president. A selection of inventory previously valued at \$150,000 had been identified as flawed earlier that month and as a result was determined to be unfit for sale. Leonard tells Wilson that he has decided to count the selected items as regular inventory and that he will "deal with it when things settle down after the first of the year. After all," and adds, "the auditors don't know good picture frame moulding from bad. We've had a rough year, and things are looking up for next year. Our division needs all the profits we can get this year. It's just a matter of timing the write-off." Leonard is Wilson's direct supervisor.

1. Describe Wilson's ethical dilemma.
2. What should Wilson do if Leonard gives him a direct order to include the inventory?

Required

1-27 Professional ethics and reporting division performance. Hannah Gilpin is the controller of Blakemore Auto Glass, a division of Eastern Glass and Window. Her division has been under pressure to improve its divisional operating income. Currently, divisions of Eastern Glass are allocated corporate overhead based on the cost of goods sold. Jake Myers, the president of the division, has asked Gilpin to reclassify \$65,000 of packaging materials, which is included in the cost of goods sold, as production cost, which is not. Doing so will save the division \$30,000 in allocated corporate overhead. The packing materials in question are needed to carry the finished goods to retail outlets. Gilpin does not see a reason for the reclassification of costs, other than to avoid overhead allocation costs.

1. Describe Gilpin's ethical dilemma.
2. What should Gilpin do if Myers gives her a direct order to reclassify the costs?

Required

Problems

1-28 Planning and control decisions, Internet company. PostNews.com offers its subscribers several services, such as an annotated TV guide and local-area information on weather, restaurants, and movie theaters. Its main revenue sources are fees for banner advertisements and fees from subscribers. Recent data are as follows:

Month/Year	Advertising Revenues	Actual Number of Subscribers	Monthly Fee per Subscriber
June 2015	\$ 415,972	29,745	\$15.50
December 2015	867,246	55,223	20.50
June 2016	892,134	59,641	20.50
December 2016	1,517,950	87,674	20.50
June 2017	2,976,538	147,921	20.50

The following decisions were made from June through October 2017:

- June 2017: Raised subscription fee to \$25.50 per month from July 2017 onward. The budgeted number of subscribers for this monthly fee is shown in the following table.
- June 2017: Informed existing subscribers that from July onward, monthly fee would be \$25.50.
- July 2017: Offered e-mail service to subscribers and upgraded other online services.
- October 2017: Dismissed the vice president of marketing after significant slowdown in subscribers and subscription revenues, based on July through September 2017 data in the following table.
- October 2017: Reduced subscription fee to \$22.50 per month from November 2017 onward.

Results for July–September 2017 are as follows:

Month/Year	Budgeted Number of Subscribers	Actual Number of Subscribers	Monthly Fee per Subscriber
July 2017	145,000	129,250	\$25.50
August 2017	155,000	142,726	25.50
September 2017	165,000	145,643	25.50

Required

- Classify each of the decisions (a–e) as a planning or a control decision.
- Give two examples of other planning decisions and two examples of other control decisions that may be made at PostNews.com.

1-29 Strategic decisions and management accounting. Consider the following series of independent situations in which a firm is about to make a strategic decision.

Decisions

- Stila Cosmetics is considering introducing an anti-aging facial cream with natural ingredients.
- Kontron Computers is deliberating to produce a special type of microprocessor with an advanced technology which will bring down the cost of production.
- Pelican Industries wants to install biometric system in its factory to reduce idle labor time and increase productivity.
- Coral Health Solutions decides to introduce a unique telemedicine facility for its remote patients.

Required

- For each decision, state whether the company is following a cost leadership or a product differentiation strategy.
- For each decision, discuss what information the managerial accountant can provide about the source of competitive advantage for these firms.

1-30 Strategic decisions and management accounting. Consider the following series of independent situations in which a firm is about to make a strategic decision.

Decisions

- Lactalis Foods is planning to come out with a special tetrizzini made with seafood, mushrooms, cream, and cocktail sauce.
- Vanford Soap has started producing a new bar of soap, eyeing the low-cost segment of the soap market in which the company does not have much presence.
- Diato Inc., a manufacturer of drill machines, is considering applying to a tender by quoting a very low price to supply 1,000 pieces of drill machines with standard features.
- Smart Pixel is considering introducing a new tablet model that features a powerful processor with ample RAM to facilitate video calling, which is one of its unique features.

Required

- For each decision, state whether the company is following a cost leadership or a product differentiation strategy.
- For each decision, discuss what information the management accountant can provide about the source of competitive advantage for these firms.

1-31 Management accounting guidelines. For each of the following items, identify which of the management accounting guidelines applies: cost–benefit approach, behavioral and technical considerations, or different costs for different purposes.

1. Analyzing whether to keep the billing function within an organization or outsource it.
2. Deciding to give bonuses for superior performance to the employees in a Japanese subsidiary and extra vacation time to the employees in a Swedish subsidiary.
3. Including costs of all the value-chain functions before deciding to launch a new product, but including only its manufacturing costs in determining its inventory valuation.
4. Considering the desirability of hiring an additional salesperson.
5. Giving each salesperson the compensation option of choosing either a low salary and a high-percentage sales commission or a high salary and a low-percentage sales commission.
6. Selecting the costlier computer system after considering two systems.
7. Installing a participatory budgeting system in which managers set their own performance targets, instead of top management imposing performance targets on managers.
8. Recording research costs as an expense for financial reporting purposes (as required by U.S. GAAP) but capitalizing and expensing them over a longer period for management performance-evaluation purposes.
9. Introducing a profit-sharing plan for employees.

1-32 Management accounting guidelines. For each of the following items, identify which of the management accounting guidelines applies: cost–benefit approach, behavioral and technical considerations, or different costs for different purposes.

1. Analyzing whether to avail an export order for which overtime payments are required.
2. Deciding on a short-term shutdown of a factory because of the lack of demand for products due to the seasonal factor. The short-term shutdown may save some overhead costs, but will result in incurring compensations to the retrenched workers.
3. Considering whether to charge the heavy repairs made to the factory premises as an expense for financial reporting purposes or capitalizing and expensing them over a longer period for management performance-evaluation purposes.
4. Deciding to impose supervisory control to limit the wastage of materials.
5. Considering introducing a performance bonus scheme to increase the productivity of employees.
6. Analyzing whether to increase the production capacity to meet the growing demands for products.
7. Contemplating changing the production process to save production time resulting in increased production.

1-33 Role of controller, role of chief financial officer. George Jimenez is the controller at Balkin Electronics, a manufacturer of devices for the computer industry. The company may promote him to chief financial officer.

1. In this table, indicate which executive is *primarily* responsible for each activity.

Required

Activity	Controller	CFO
Managing the company's long-term investments		
Presenting the financial statements to the board of directors		
Strategic review of different lines of businesses		
Budgeting funds for a plant upgrade		
Managing accounts receivable		
Negotiating fees with auditors		
Assessing profitability of various products		
Evaluating the costs and benefits of a new product design		

2. Based on this table and your understanding of the two roles, what types of training or experience will George find most useful for the CFO position?

1-34 Budgeting, ethics, pharmaceutical company. Chris Jackson was recently promoted to Controller of Research and Development (R&D) for BrisCor, a *Fortune* 500 pharmaceutical company that manufactures prescription drugs and nutritional supplements. The company's total R&D cost for 2017 was expected (budgeted) to be \$5 billion. During the company's midyear budget review, Chris realized that current R&D expenditures were already at \$3.5 billion, nearly 40% above the midyear target. At this current rate of expenditure, the R&D division was on track to exceed its total year-end budget by \$2 billion!

In a meeting with CFO Ronald Meece later that day, Jackson delivered the bad news. Meece was both shocked and outraged that the R&D spending had gotten out of control. Meece wasn't any more understanding when Jackson revealed that the excess cost was entirely related to research and development of a new drug, Vyacon, which was expected to go to market next year. The new drug would result in large profits for BrisCor, if the product could be approved by year-end.

Meece had already announced his expectations of third-quarter earnings to Wall Street analysts. If the R&D expenditures weren't reduced by the end of the third quarter, Meece was certain that the targets he had announced publicly would be missed and the company's stock price would tumble. Meece instructed Jackson to make up the budget shortfall by the end of the third quarter using "whatever means necessary."

Jackson was new to the controller's position and wanted to make sure that Meece's orders were followed. Jackson came up with the following ideas for making the third-quarter budgeted targets:

- a. Stop all research and development efforts on the drug Vyacon until after year-end. This change would delay the drug going to market by at least 6 months. It is possible that in the meantime a BrisCor competitor could make it to market with a similar drug.
- b. Sell off rights to the drug Martek. The company had not planned on doing this because, under current market conditions, it would get less than fair value. It would, however, result in a one-time gain that could offset the budget shortfall. Of course, all future profits from Martek would be lost.
- c. Capitalize some of the company's R&D expenditures, reducing R&D expense on the income statement. This transaction would not be in accordance with GAAP, but Jackson thought it was justifiable because the Vyacon drug was going to market early next year. Jackson would argue that capitalizing R&D costs this year and expensing them next year would better match revenues and expenses.

Required

1. Referring to the "Standards of Ethical Behavior for Practitioners of Management Accounting and Financial Management," Exhibit 1-7 (page 37), which of the preceding items (a–c) are acceptable to use? Which are unacceptable?
2. What would you recommend Jackson do?

1-35 Professional ethics and end-of-year actions. Phoenix Press produces consumer magazines. The house and home division, which sells home-improvement and home-decorating magazines, has seen a 15% reduction in operating income over the past 15 months, primarily due to an economic recession and a depressed consumer housing market. The division's Controller, Sophie Gellar, has been pressurized by the CFO to improve her division's operating results by the end of the year. Gellar is considering the following options for improving the division's performance by the end of the year:

- a. Cancelling three of the division's least profitable magazines, resulting in the layoff of 30 employees.
- b. Selling the new printing equipment that was purchased in February and replacing it with discarded equipment from one of the company's other divisions. The previously discarded equipment no longer meets current safety standards.
- c. Recognizing unearned subscription revenue (cash received in advance for magazines that will be delivered in the future) as revenue when cash is received in the current month (just before the fiscal year-end), instead of depicting it as a liability.
- d. Reducing liability and expenses related to employee pensions. This would increase the division's operating income by 5%.
- e. Recognizing advertising revenues that relate to February in December.
- f. Delaying maintenance on production equipment until January, although it was originally scheduled for October.

Required

1. What are the motivations for Gellar to improve the division's year-end operating earnings?
2. From the point of view of the "Standards of Ethical Behavior for Practitioners of Management Accounting and Financial Management," Exhibit 1-7 (page 37), which of the preceding items (a–f) are acceptable? Which of the aforementioned items are unacceptable?
3. How should Gellar handle the pressure to improve performance?

1-36 Professional ethics and end-of-year actions. Linda Butler is the new division controller of the snack-foods division of Daniel Foods. Daniel Foods has reported a minimum 15% growth in annual earnings for each of the past 5 years. The snack-foods division has reported annual earnings growth of more than 20% each year in this same period. During the current year, the economy went into a recession. The corporate controller estimates a 10% annual earnings growth rate for Daniel Foods this year. One month before the December 31 fiscal year-end of the current year, Butler estimates the snack-foods division will report an annual earnings growth of only 8%. Rex Ray, the snack-foods division president, is not happy, but he notes that the "end-of-year actions" still need to be taken.

Butler makes some inquiries and is able to compile the following list of end-of-year actions that were more or less accepted by the previous division controller:

- a. Deferring December's routine monthly maintenance on packaging equipment by an independent contractor until January of next year.
- b. Extending the close of the current fiscal year beyond December 31 so that some sales of next year are included in the current year.

- c. Altering dates of shipping documents of next January's sales to record them as sales in December of the current year.
 - d. Giving salespeople a double bonus to exceed December sales targets.
 - e. Deferring the current period's advertising by reducing the number of television spots run in December and running more than planned in January of next year.
 - f. Deferring the current period's reported advertising costs by having Daniel Foods' outside advertising agency delay billing December advertisements until January of next year or by having the agency alter invoices to conceal the December date.
 - g. Persuading carriers to accept merchandise for shipment in December of the current year even though they normally would not have done so.
1. Why might the snack-foods division president want to take these end-of-year actions?
 2. Butler is deeply troubled and reads the "Standards of Ethical Behavior for Practitioners of Management Accounting and Financial Management" in Exhibit 1-7 (page 37). Classify each of the end-of-year actions (a–g) as acceptable or unacceptable according to that document.
 3. What should Butler do if Ray suggests that these end-of-year actions are taken in every division of Daniel Foods and that she will greatly harm the snack-foods division if she does not cooperate and paint the rosiest picture possible of the division's results?

Required

1-37 Ethical challenges, global company environmental concerns. Contemporary Interiors (CI) manufactures high-quality furniture in factories in North Carolina for sale to top American retailers. In 1995, CI purchased a lumber operation in Indonesia, and shifted from using American hardwoods to Indonesian ramin in its products. The ramin proved to be a cheaper alternative, and it was widely accepted by American consumers. CI management credits the early adoption of Indonesian wood for its ability to keep its North Carolina factories open when so many competitors closed their doors. Recently, however, consumers have become increasingly concerned about the sustainability of tropical woods, including ramin. CI has seen sales begin to fall, and the company was even singled out by an environmental group for boycott. It appears that a shift to more sustainable woods before year-end will be necessary, and more costly.

In response to the looming increase in material costs, CEO Geoff Armstrong calls a meeting of upper management. The group generates the following ideas to address customer concerns and/or salvage company profits for the current year:

- a. Pay local officials in Indonesia to "certify" the ramin used by CI as sustainable. It is not certain whether the ramin would be sustainable or not. Put highly visible tags on each piece of furniture to inform consumers of the change.
 - b. Make deep cuts in pricing through the end of the year to generate additional revenue.
 - c. Record executive year-end bonus compensation accrued for the current year when it is paid in the next year after the December fiscal year-end.
 - d. Reject the change in materials. Counter the bad publicity with an aggressive ad campaign showing the consumer products as "made in the USA," since manufacturing takes place in North Carolina.
 - e. Redesign upholstered furniture to replace ramin contained inside with less expensive recycled plastic. The change in materials would not affect the appearance or durability of the furniture. The company would market the furniture as "sustainable."
 - f. Pressure current customers to take early delivery of goods before the end of the year so that more revenue can be reported in this year's financial statements.
 - g. Begin purchasing sustainable North American hardwoods and sell the Indonesian lumber subsidiary. Initiate a "plant a tree" marketing program, by which the company will plant a tree for every piece of furniture sold. Material costs would increase 25%, and prices would be passed along to customers.
 - h. Sell off production equipment prior to year-end. The sale would result in one-time gains that could offset the company's lagging profits. The owned equipment could be replaced with leased equipment at a lower cost in the current year.
 - i. Recognize sales revenues on orders received but not shipped as of the end of the year.
1. As the management accountant for Contemporary Interiors, evaluate each of the preceding items (a–i) in the context of the "Standards of Ethical Behavior for Practitioners of Management Accounting and Financial Management," Exhibit 1-7 (page 37). Which of the items are in violation of these ethics standards and which are acceptable?
 2. What should the management accountant do with regard to those items that are in violation of the ethical standards for management accountants?

Required

2

An Introduction to Cost Terms and Purposes

LEARNING OBJECTIVES

- 1 Define and illustrate a cost object
- 2 Distinguish between direct costs and indirect costs
- 3 Explain variable costs and fixed costs
- 4 Interpret unit costs cautiously
- 5 Distinguish inventoriable costs from period costs
- 6 Illustrate the flow of inventoriable and period costs
- 7 Explain why product costs are computed in different ways for different purposes
- 8 Describe a framework for cost accounting and cost management

What does the word **cost** mean to you?

Is it the price you pay for something of value, like a cell phone? A cash outflow, like monthly rent? Something that affects profitability, like salaries? Organizations, like individuals, deal with different types of costs. They incur costs to generate revenues. Unfortunately, when times are bad and revenues decline, companies may find that they are unable to cut costs fast enough, leading to Chapter 11 bankruptcy. This was the case with surf wear company, Quiksilver.

HIGH FIXED COSTS BANKRUPT QUIKSILVER¹

In 2015, surf wear company, Quiksilver, announced it had filed for Chapter 11 bankruptcy. Its high fixed costs—costs that did not decrease as the number of boardshorts and hoodies sold declined—crippled the company.

In the 1990s and early 2000s, Quiksilver rode the wave of young shoppers emulating the cool lifestyle and fashions of surfers, skateboarders, and snowboarders to financial success. During this time, the company opened hundreds of retail stores worldwide,

many in expensive areas such as Times Square in New York. This expansion saddled the company with a huge amount of debt. In 2015, as sales rapidly declined, the company collapsed under the weight of its high fixed operating costs—like long-term leases and salaries—and crippling debt-servicing payments. After declaring bankruptcy, Quiksilver began rapidly selling off non-core brands and closing many retail stores.

As the story of Quiksilver illustrates, managers must understand their firms' costs and closely manage them. Organizations as varied as the United Way, the Mayo Clinic, and Sony generate reports containing a variety of cost concepts and terms managers need to understand to effectively run their businesses. This chapter discusses cost concepts and terms that are the basis of accounting information used for internal and external reporting.



Richard Naude/Alamy Stock Photo

¹ Sources: Andrew Khouri, "Wipeout: Quiksilver files for Chapter 11 bankruptcy in U.S.," *Los Angeles Times*, September 9, 2015 (<http://www.latimes.com/business/la-fi-quiksilver-bankruptcy-20150909-story.html>); Deborah Belgum, "Oaktree Capital Working on Buying Quiksilver," *California Apparel News*, November 3, 2015 (<https://www.apparelnews.net/news/2015/nov/03/oaktree-capital-working-buying-quiksilver>).

Costs and Cost Terminology

A **cost** is a resource sacrificed or forgone to achieve a specific objective. A cost (such as the cost of labor or advertising) is usually measured as the monetary amount that must be paid to acquire goods or services. An **actual cost** is the cost incurred (a historical or past cost), as distinguished from a **budgeted cost**, which is a predicted, or forecasted, cost (a future cost).

When you think of a cost, you invariably think of it in the context of putting a price on a particular thing. We call this “thing” a **cost object**, which is anything for which a cost measurement is desired. Suppose you’re a manager at BMW’s automotive manufacturing plant in Spartanburg, South Carolina. Can you identify some of the plant’s cost objects? Now look at Exhibit 2-1.

You will see that BMW managers not only want to know the cost of various products, such as the BMW X6 sports activity vehicle, but they also want to know the costs of services, projects, activities, departments, and supporting customers. Managers use their knowledge of these costs to guide decisions about, for example, product innovation, quality, and customer service.

Now think about whether a manager at BMW might want to know the *budgeted cost* or the *actual cost* of a cost object. Managers almost always need to know both types of costs when making decisions. For example, comparing budgeted costs to actual costs helps managers evaluate how well they did controlling costs and learn about how they can do better in the future.

How does a cost system determine the costs of various cost objects? Typically in two stages: accumulation followed by assignment. **Cost accumulation** is the collection of cost data in some organized way by means of an accounting system. For example, at its Spartanburg plant, BMW collects (accumulates) in various categories the costs of different types of materials, different classifications of labor, the costs incurred for supervision, and so on. The accumulated costs are then *assigned* to designated cost objects, such as the different models of cars that BMW manufactures at the plant. BMW managers use this cost information in two main ways: (1) when *making* decisions, for instance, about how to price different models of cars or how much to invest in R&D and marketing and (2) for *implementing* decisions, by influencing and motivating employees to act, for example, by providing bonuses to employees for reducing costs.

Now that we know why it is useful for management accountants to assign costs, we turn our attention to some concepts that will help us do it. Again, think of the different types of costs that we just discussed—materials, labor, and supervision. You are probably thinking that some costs, such as the costs of materials, are easier to assign to a cost object than others, such as the costs of supervision. As you will learn, this is indeed the case.

Direct Costs and Indirect Costs

Costs are classified as direct and indirect costs. Management accountants use a variety of methods to assign these costs to cost objects.

- **Direct costs of a cost object** are related to the particular cost object and can be traced to it in an economically feasible (cost-effective) way. For example, the cost of steel or tires is a direct cost of BMW X6s. The cost of the steel or tires can be easily traced to or

LEARNING OBJECTIVE 1

Define and illustrate a cost object

... examples of cost objects are products, services, activities, processes, and customers

DECISION POINT

What is a cost object?

LEARNING OBJECTIVE 2

Distinguish between direct costs

... costs that are traced to the cost object

and indirect costs

... costs that are allocated to the cost object

EXHIBIT 2-1 Examples of Cost Objects at BMW

Cost Object	Illustration
Product	A BMW X6 sports activity vehicle
Service	Telephone hotline providing information and assistance to BMW dealers
Project	R&D project on enhancing the navigation system in BMW cars
Customer	Herb Chambers Motors, the BMW dealer that purchases a broad range of BMW vehicles
Activity	Setting up machines for production or maintaining production equipment
Department	Environmental, health, and safety department

identified with the BMW X6. As workers on the BMW X6 line request materials from the warehouse, the material requisition document identifies the cost of the materials supplied to the X6. Similarly, individual workers record on their time sheets the hours and minutes they spend working on the X6. The cost of this labor can easily be traced to the X6 and is another example of a direct cost. The term **cost tracing** is used to describe the assignment of direct costs to a particular cost object.

- **Indirect costs of a cost object** are related to the particular cost object, but cannot be traced to it in an economically feasible (cost-effective) way. For example, the salaries of plant administrators (including the plant manager) who oversee production of the many different types of cars produced at the Spartanburg plant are an indirect cost of the X6s. Plant administration costs are related to the cost object (X6s) because plant administration is necessary for managing the production of these vehicles. Plant administration costs are indirect costs because plant administrators also oversee the production of other products, such as the Z4 Roadster. Unlike steel or tires, there is no specific request made by supervisors of the X6 production line for plant administration services, and it is virtually impossible to trace plant administration costs to the X6 line. The term **cost allocation** is used to describe the assignment of indirect costs to a particular cost object.

Cost assignment is a general term that encompasses both (1) tracing direct costs to a cost object and (2) allocating indirect costs to a cost object. Exhibit 2-2 depicts direct costs and indirect costs and both forms of cost assignment—cost tracing and cost allocation—using the BMW X6 as an example.

Cost Allocation Challenges

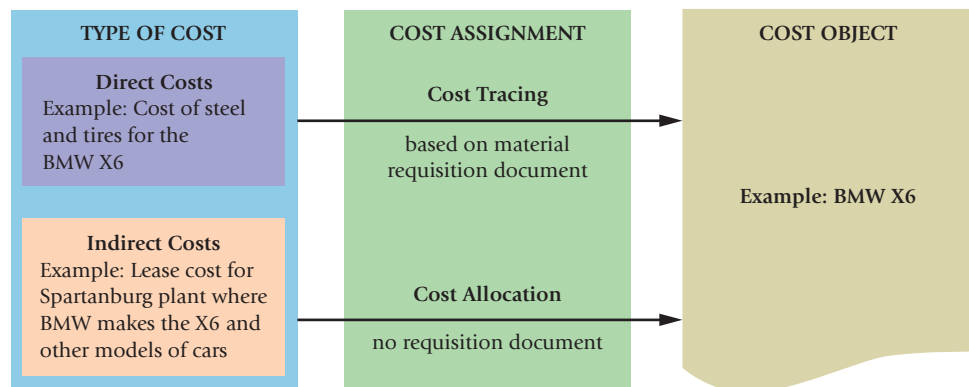
Managers want to assign costs accurately to cost objects because inaccurate product costs will mislead managers about the profitability of different products. This could result, for example, in managers unknowingly promoting less-profitable products instead of more-profitable products.

Managers are much more confident about the accuracy of the direct costs of cost objects, such as the cost of steel and tires of the X6, because these costs can be easily traced to the cost object. Indirect costs are a different story. Some indirect costs can be assigned to cost objects reasonably accurately. Others are more difficult.

Consider the cost to lease the Spartanburg plant. This cost is an indirect cost of the X6—there is no separate lease agreement for the area of the plant where the X6 is made. Nonetheless, BMW *allocates* to the X6 a part of the lease cost of the building—for example, on the basis of an estimate of the percentage of the building's floor space occupied for the production of the X6 relative to the total floor space used to produce all models of cars. This approach measures the building resources used by each car model reasonably and accurately. The more floor space a car model occupies, the greater the lease costs assigned to it. Accurately allocating other indirect costs, such as plant administration, to the X6, however, is more difficult. For example, should these costs be allocated on the basis

EXHIBIT 2-2

Cost Assignment to a Cost Object



of the number of employees working on each car model or the number of cars produced of each model? Measuring the share of plant administration used by each car model is not clear-cut.

Factors Affecting Direct/Indirect Cost Classifications

Several factors affect whether a cost is classified as direct or indirect:

- **The materiality of the cost in question.** The smaller the amount of a cost—that is, the more immaterial the cost is—the less likely it is economically feasible to trace it to a particular cost object. Consider a mail-order catalog company such as Lands’ End. It would be economically feasible to trace the courier charge for delivering a package to an individual customer as a direct cost. In contrast, the cost of the invoice paper included in the package would be classified as an indirect cost. Why? Although the cost of the paper can be traced to each customer, it is not cost-effective to do so. The benefits of knowing that, say, exactly 0.5¢ worth of paper is included in each package do not exceed the data processing and administrative costs of tracing the cost to each package. The time of the sales administrator, who earns a salary of \$45,000 a year, is better spent organizing customer information to help with a company’s marketing efforts than tracking the cost of paper.
- **Available information-gathering technology.** Improvements in information-gathering technology make it possible to consider more and more costs as direct costs. Bar codes, for example, allow manufacturing plants to treat certain low-cost materials such as clips and screws, which were previously classified as indirect costs, as direct costs of products. At Dell, component parts such as the computer chip and the DVD drive display a bar code that can be scanned at every point in the production process. Bar codes can be read into a manufacturing cost file by waving a “wand” in the same quick and efficient way supermarket checkout clerks enter the cost of each item purchased by a customer.
- **Design of operations.** Classifying a cost as direct is easier if a company’s facility (or some part of it) is used exclusively for a specific cost object, such as a specific product or a particular customer. For example, General Chemicals classifies the cost of its facility dedicated to manufacturing soda ash (sodium carbonate) as a direct cost of soda ash.

Be aware that a specific cost may be both a direct cost of one cost object and an indirect cost of another cost object. *That is, the direct/indirect classification depends on the choice of the cost object.* For example, the salary of an assembly department supervisor at BMW is a direct cost if the cost object is the assembly department. However, because the assembly department assembles many different models, the supervisor’s salary is an indirect cost if the cost object is a specific product such as the BMW X6 sports activity vehicle. A useful rule to remember is that the broader the cost object definition—the assembly department, rather than the X6—the higher the direct costs portion of total costs and the more confident a manager will be about the accuracy of the resulting cost amounts.

One final point. A company can incur a cost—sacrifice a resource—without the cost being recorded in the accounting system. For example, certain retirement health benefits are only recorded in the accounting system after an employee retires although the cost is incurred while the employee is actually providing the service. Environmental costs are another example. Many companies, for example General Electric, have had to incur significant costs at a later date to clean up the environmental damage that was caused by actions taken several years earlier. To force managers to consider these costs when making decisions, some companies such as Novartis, the Swiss pharmaceutical giant, are imputing a cost in their cost accounting system for every ton of greenhouse gases emitted to surrogate for future environmental costs. These costs can be a direct cost of a product if they can be traced to a specific product. More commonly, these costs are associated with operating a manufacturing facility and cannot be traced to a specific product. In this case, they are indirect costs.

DECISION POINT

How do managers decide whether a cost is a direct or an indirect cost?

Cost-Behavior Patterns: Variable Costs and Fixed Costs

LEARNING OBJECTIVE 3

Explain variable costs and fixed costs
...the two basic ways in which costs behave

Costing systems record the cost of resources acquired, such as materials, labor, and equipment, and track how those resources are used to produce and sell products or services. This allows managers to see how costs behave. Consider two basic types of cost-behavior patterns found in many accounting systems. A **variable cost** changes *in total* in proportion to changes in the related level of total activity or volume of output produced. A **fixed cost** remains unchanged *in total* for a given time period, despite wide changes in the related level of total activity or volume of output produced. Note that costs are defined as variable or fixed for *a specific activity* and for *a given time period*. Identifying a cost as variable or fixed provides valuable information for making many management decisions and is an important input when evaluating performance. To illustrate these two basic types of costs, again consider the costs at BMW’s Spartanburg, South Carolina, plant.

- 1. **Variable costs.** If BMW buys a steering wheel at \$600 for each of its BMW X6 vehicles, then the total cost of steering wheels is \$600 times the number of vehicles produced, as the following table illustrates.

Number of X6s Produced (1)	Variable Cost per Steering Wheel (2)	Total Variable Cost of Steering Wheels (3) = (1) × (2)
1	\$600	\$ 600
1,000	600	600,000
3,000	600	1,800,000

The steering wheel cost is an example of a variable cost because *total cost* changes in proportion to changes in the number of vehicles produced. However, the *cost per unit* of a variable cost is constant. For example, the variable cost per steering wheel in column 2 is the same regardless of whether 1,000 or 3,000 X6s are produced. As a result, the total variable cost of steering wheels in column 3 changes proportionately with the number of X6s produced in column 1. So, when considering how variable costs behave, always focus on *total costs*.

Panel A in Exhibit 2-3 shows a graph of the total variable cost of steering wheels. The cost is represented by a straight line that climbs from left to right. The phrases “strictly variable” or “proportionately variable” are sometimes used to describe the variable cost behavior shown in this panel.

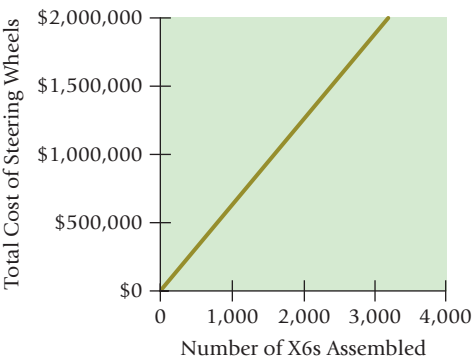
Now consider an example of a variable cost for a different activity—the \$20 hourly wage paid each worker to set up machines at the Spartanburg plant. The setup labor cost is a variable cost for setup hours because setup cost changes in total in proportion to the number of setup hours used.

- 2. **Fixed costs.** Suppose BMW incurs a total cost of \$2,000,000 per year for supervisors who work exclusively on the X6 line. These costs are unchanged in total over a designated range of vehicles produced during a given time span (see Exhibit 2-3, Panel B). Fixed costs become

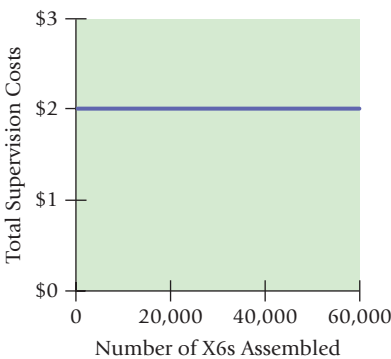
EXHIBIT 2-3

Graphs of Variable and Fixed Costs

PANEL A: Variable Cost of Steering Wheels at \$600 per BMW X6 Assembled



PANEL B: Supervision Costs for the BMW X6 assembly line (in millions)



smaller and smaller on a per-unit basis as the number of vehicles assembled increases, as the following table shows.

Annual Total Fixed Supervision Costs for BMW X6 Assembly Line	Number of X6s Produced	Fixed Supervision Cost per X6
(1)	(2)	(3) = (1) ÷ (2)
\$2,000,000	10,000	\$200
\$2,000,000	25,000	\$ 80
\$2,000,000	50,000	\$ 40

It is precisely because *total* line supervision costs are fixed at \$2,000,000 that the fixed supervision cost per X6 decreases as the number of X6s produced increases; the same fixed cost is spread over a larger number of X6s. Do not be misled by the change in fixed cost per unit. Just as in the case of variable costs, when considering fixed costs, always focus on *total costs*. Costs are fixed when total costs remain unchanged despite significant changes in the level of total activity or volume.

Why are some costs variable and other costs fixed? Recall that a cost is usually measured as the amount of money that must be paid to acquire goods and services. The total cost of steering wheels is a variable cost because BMW buys the steering wheels only when they are needed. As more X6s are produced, proportionately more steering wheels are acquired and proportionately more costs are incurred.

Contrast the plant's variable costs with the \$2,000,000 of fixed costs per year incurred for the supervision of the X6 assembly line. This level of supervision is acquired and put in place well before BMW uses it to produce X6s and before BMW even knows how many X6s it will produce. Suppose that BMW puts in place supervisors capable of supervising the production of 60,000 X6s each year. If the demand is for only 55,000 X6s, there will be idle capacity. Supervisors on the X6 line could have supervised the production of 60,000 X6s but will supervise only 55,000 X6s because of the lower demand. However, BMW must pay for the unused line supervision capacity because the cost of supervision cannot be reduced in the short run. If demand is even lower—say only 50,000 X6s are demanded—the plant's line supervision costs will still be \$2,000,000, and its idle capacity will increase.

Unlike variable costs, fixed costs of resources (such as for line supervision) cannot be quickly and easily changed to match the resources needed or used. Over time, however, managers can take action to reduce a company's fixed costs. For example, if the X6 line needs to be run for fewer hours because the demand for the vehicles falls, BMW may lay off supervisors or move them to another production line. Unlike variable costs that go away automatically if the resources are not used, reducing fixed costs requires active intervention on the part of managers.

Do not assume that individual cost items are inherently variable or fixed. Consider labor costs. Labor costs can be purely variable for units produced when workers are paid on a piece-unit basis (for each unit they make). For example, some companies pay garment workers on a per-shirt-sewed basis, so the firms' labor costs are variable. That is, total costs depend on how many shirts workers make. In contrast, other companies negotiate labor union agreements with set annual salaries that contain no-layoff clauses for workers. At a company such as this, the salaries would appropriately be classified as fixed. For decades, Japanese companies provided their workers a lifetime guarantee of employment. Although such a guarantee entails higher fixed labor costs, a firm can benefit because workers are more loyal and dedicated, which can improve productivity. However, during an economic downturn, the company risks losing money if revenues decrease while fixed costs remain unchanged. The recent global economic crisis has made companies very reluctant to lock in fixed costs. Concepts in Action: Zipcar Helps Twitter Reduce Fixed Costs describes how a car-sharing service offers companies the opportunity to convert the fixed costs of owning corporate cars into variable costs by renting cars on an as-needed basis.

A particular cost item could be variable for one level of activity and fixed for another. Consider annual registration and license costs for a fleet of planes owned by an airline company. Registration and license costs would be a variable cost that would change with the

CONCEPTS IN ACTION

Zipcar Helps Twitter Reduce Fixed Costs



Mike Kahn/Green Stock Media/Alamy Stock Photo

In many cities worldwide, car sharing is an effective way for companies to reduce spending on gas, insurance, and parking of corporate cars. Zipcar—a car sharing company that provides an “on-demand” option for urban individuals and businesses to rent a car by the week, the day, or even the hour—has rates beginning around \$7 per hour and \$79 per day (including gas, insurance, and about 180 miles per day).

Let’s think about what Zipcar means for companies. Many businesses own company cars for getting to meetings, picking up clients, making deliveries, and running errands. Traditionally, owning these cars has involved high fixed costs, including buying the asset (car), maintenance costs, and insurance for multiple drivers.

Now, however, companies like Twitter, based in downtown San Francisco, can use Zipcar for on-demand mobility while reducing their transportation and overhead costs. From a business perspective, Zipcar allows Twitter and other companies to convert the fixed costs of owning a company car to variable costs. If business slows or a car isn’t required to visit a client, Twitter is not saddled with the fixed costs of car ownership. Of course, when business is good, causing Twitter managers to use Zipcar more often, they can end up paying more overall than they would have paid if they purchased and maintained the car themselves. It is also convenient. “We ... avoid the cost of taking taxis everywhere or the time delays of mass transit,” said Jack Dorsey, the online social networking service’s co-founder. “Zipcar’s the fastest, easiest way to get around town.”

Along with cutting company spending, car sharing services like Zipcar contribute to environmental sustainability. In 2015, research found that Zipcar’s business program eliminated the need for roughly 33,000 cars across North America. Kaye Ceille, the company’s president said, “Businesses are increasingly conscious of their environmental footprint, and we’re proud that ... Zipcar for business has many significant environmental benefits for companies, including reducing vehicles on the road.”

Sources: Elizabeth Olsen, “Car Sharing Reinvents the Company Wheels,” *New York Times*, May 7, 2009 (<http://www.nytimes.com/2009/05/07/business/businessspecial/07CAR.html>); Zipcar, Inc., “Case Studies: Twitter” (<http://www.zipcar.com/business/is-it/case-studies>); Zipcar, Inc., “San Francisco Bay Area Rates & Plans” (<http://www.zipcar.com/sf/check-rates>); “New Research Finds Business Use of Zipcar Reduces Personal Car Ownership,” Zipcar, Inc. press release, Boston, MA, July 27, 2015 (<http://www.zipcar.com/press/releases/z4breducecarownership>).

DECISION POINT

How do managers decide whether a cost is a variable or a fixed cost?

number of planes the company owned. But the registration and license costs for a particular plane are fixed regardless of the miles flown by that plane during a year.

Some costs have both fixed and variable elements and are called *mixed* or *semivariable* costs. For example, a company’s telephone costs may consist of a fixed monthly cost as well as a cost per phone-minute used. We discuss mixed costs and techniques to separate out their fixed and variable components in Chapter 10.

TRY IT! 2-1

Pepsi Corporation uses trucks to transport bottles from the warehouse to different retail outlets. Gasoline costs are \$0.15 per mile driven. Insurance costs are \$6,000 per year. Calculate the total costs and the cost per mile for gasoline and insurance if the truck is driven (a) 20,000 miles per year or (b) 30,000 miles per year.

Cost Drivers

A **cost driver** is a variable, such as the level of activity or volume, that causally affects costs over a given time span. An *activity* is an event, task, or unit of work with a specified purpose—for example, designing products, setting up machines, or testing products. The level of activity or volume is a cost driver if there is a cause-and-effect relationship between a change in the level of activity or volume and a change in the level of total costs. For example,

if product-design costs change with the number of parts in a product, the number of parts is a cost driver of product-design costs. Similarly, the miles driven by trucks to deliver products are a cost driver of distribution costs.

The cost driver of a variable cost is the level of activity or volume whose change causes proportionate changes in the variable cost. For example, the number of vehicles assembled is the cost driver of the total cost of steering wheels. If setup workers are paid an hourly wage, the number of setup hours is the cost driver of total (variable) setup costs.

Costs that are fixed in the short run have no cost driver in the short run but may have a cost driver in the long run. Consider the costs of testing, say, 0.1% of the color printers produced at a Hewlett-Packard plant. These costs consist of equipment and staff costs of the testing department, which are difficult to change. Consequently, they are fixed in the short run regardless of changes in the volume of production. In this case, volume of production is not a cost driver of testing costs in the short run. In the long run, however, Hewlett-Packard will increase or decrease the testing department's equipment and staff to the levels needed to support future production volumes. In the long run, volume of production is a cost driver of testing costs. Costing systems that identify the cost of each activity such as testing, design, or setup are called *activity-based costing systems*.

Relevant Range

Relevant range is the band or range of normal activity level or volume in which there is a specific relationship between the level of activity or volume and the cost in question. For example, a fixed cost is fixed only in relation to a given wide range of total activity or volume (at which the company is expected to operate) and only for a given time span (usually a particular budget period). Suppose BMW contracts with Thomas Transport Company (TTC) to transport X6s to BMW dealerships. TTC rents two trucks, and each truck has an annual fixed rental cost of \$40,000. The maximum annual usage of each truck is 120,000 miles. In the current year (2017), the predicted combined total hauling of the two trucks is 170,000 miles.

Exhibit 2-4 shows how annual fixed costs behave at different levels of miles of hauling. Up to 120,000 miles, TTC can operate with one truck; from 120,001 to 240,000 miles, it operates with two trucks; and from 240,001 to 360,000 miles, it operates with three trucks. This pattern will continue as TTC adds trucks to its fleet to provide more miles of hauling. Given the predicted 170,000-mile usage for 2017, the range from 120,001 to 240,000 miles hauled is the range in which TTC expects to operate, resulting in fixed rental costs of \$80,000. Within this relevant range, changes in miles hauled will not affect the annual fixed costs.

Fixed costs may change from one year to the next, though. For example, if the total rental fee of the two trucks increases by \$2,000 for 2018, the total level of fixed costs will increase to \$82,000 (all else remaining the same). If that increase occurs, total rental costs will be fixed at this new level (\$82,000) for 2018 for the miles hauled in the 120,001 to 240,000 range.

The relevant range also applies to variable costs. Outside the relevant range, variable costs, such as direct materials costs, may no longer change proportionately with changes in production volumes. For example, above a certain volume, the cost of direct materials may

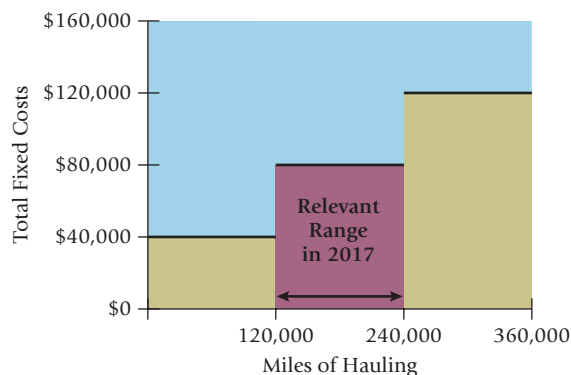


EXHIBIT 2-4

Fixed-Cost Behavior
at Thomas Transport
Company

EXHIBIT 2-5

Examples of Costs in Combinations of the Direct/Indirect and Variable/Fixed Cost Classifications for a Car Manufacturer

		Assignment of Costs to Cost Object	
		Direct Costs	Indirect Costs
Cost-Behavior Pattern	Variable Costs	- Cost object: BMW X6s produced - Example: Tires used in assembly of automobile	- Cost object: BMW X6s produced - Example: Power costs at Spartanburg plant. Power usage is metered only to the plant, where multiple products are assembled.
	Fixed Costs	- Cost object: BMW X6s produced - Example: Salary of supervisor on BMW X6 assembly line	- Cost object: BMW X6s produced - Example: Annual lease costs at Spartanburg plant. Lease is for whole plant, where multiple products are produced.

increase at a lower rate because a firm may be able to negotiate price discounts for purchasing greater amounts of materials from its suppliers.

Relationships Between Types of Costs

We have introduced two major classifications of costs: direct/indirect and variable/fixed. Costs may simultaneously be as follows:

- Direct and variable
- Direct and fixed
- Indirect and variable
- Indirect and fixed

Exhibit 2-5 shows examples of costs in each of these four cost classifications for the BMW X6.

Total Costs and Unit Costs

The preceding section concentrated on the behavior patterns of total costs in relation to activity or volume levels. But what about unit costs?

Unit Costs

A **unit cost**, also called an **average cost**, is calculated by dividing the total cost by the related number of units produced. In many decision contexts, calculating a unit cost is essential. Consider the booking agent who has to make the decision to book Paul McCartney to play at Shea Stadium. She estimates the cost of the event to be \$4,000,000. This knowledge is helpful for the decision, but it is not enough.

Before reaching a decision, the booking agent also must predict the number of people who will attend. Without knowing the number of attendees, she cannot make an informed decision about the admission price she needs to charge to recover the cost of the event or even on whether to have the event at all. So she computes the unit cost of the event by dividing the total cost (\$4,000,000) by the expected number of people who will attend. If 50,000

LEARNING OBJECTIVE 4

Interpret unit costs cautiously

...for many decisions, managers should use total costs, not unit costs

people attend, the unit cost is \$80 ($4,000,000 \div 50,000$) per person; if 20,000 attend, the unit cost increases to \$200 ($4,000,000 \div 20,000$). Unless the total cost is “unitized” (that is, averaged by the level of activity or volume), the \$4,000,000 cost is difficult to use to make decisions. The unit cost combines the total cost and the number of people in a simple and understandable way.

Accounting systems typically report both total-cost amounts and average-cost-per-unit amounts. The units might be expressed in various ways. Examples are automobiles assembled, packages delivered, or hours worked. Consider Tennessee Products, a manufacturer of speaker systems with a plant in Memphis. Suppose that, in 2017, its first year of operations, the company incurs \$40,000,000 of manufacturing costs to produce 500,000 speaker systems. Then the unit cost is \$80:

$$\frac{\text{Total manufacturing costs}}{\text{Number of units manufactured}} = \frac{\$40,000,000}{500,000 \text{ units}} = \$80 \text{ per unit}$$

If 480,000 units are sold and 20,000 units remain in ending inventory, the unit-cost concept helps managers determine total costs in the income statement and balance sheet and, therefore, the financial results Tennessee Products reports to shareholders, banks, and the government.

Cost of goods sold in the income statement, 480,000 units $\times$ \$80 per unit	\$38,400,000
Ending inventory in the balance sheet, 20,000 units $\times$ \$80 per unit	1,600,000
Total manufacturing costs of 500,000 units	<u>\$40,000,000</u>

Unit costs are found in all areas of the value chain—for example, the unit cost of a product design, a sales visit, and a customer-service call. By summing unit costs throughout the value chain, managers calculate the unit cost of the different products or services they deliver and determine the profitability of each product or service. Managers use this information, for example, to decide the products in which they should invest more resources, such as R&D and marketing, and the prices they should charge.

Use Unit Costs Cautiously

Although unit costs are regularly used in financial reports and for making product mix and pricing decisions, *managers should think in terms of total costs rather than unit costs for many decisions*. Consider the manager of the Memphis plant of Tennessee Products. Assume the \$40,000,000 in costs in 2017 consist of \$10,000,000 of fixed costs and \$30,000,000 of variable costs (at \$60 variable cost per speaker system produced). Suppose the total fixed costs and the variable cost per speaker system in 2018 are expected to be unchanged from 2017. The budgeted costs for 2018 at different production levels, calculated on the basis of total variable costs, total fixed costs, and total costs, are:

Units Produced (1)	Variable Cost per Unit (2)	Total Variable Costs (3) = (1) $\times$ (2)	Total Fixed Costs (4)	Total Costs (5) = (3) + (4)	Unit Cost (6) = (5) $\div$ (1)
100,000	\$60	\$ 6,000,000	\$10,000,000	\$16,000,000	\$160.00
200,000	\$60	\$12,000,000	\$10,000,000	\$22,000,000	\$110.00
500,000	\$60	\$30,000,000	\$10,000,000	\$40,000,000	\$ 80.00
800,000	\$60	\$48,000,000	\$10,000,000	\$58,000,000	\$ 72.50
1,000,000	\$60	\$60,000,000	\$10,000,000	\$70,000,000	\$ 70.00

A plant manager who uses the 2017 unit cost of \$80 per unit will underestimate actual total costs if the plant's 2018 output is below the 2017 level of 500,000 units. If the volume produced falls to 200,000 units due to, say, the presence of a new competitor and less demand, actual costs would be \$22,000,000. The unit cost of \$80 times 200,000 units equals \$16,000,000, which underestimates the actual total costs by \$6,000,000 ($\$22,000,000 - \$16,000,000$). In other words, *the unit cost of \$80 applies only when the company produces 500,000 units*.

DECISION POINT

How should managers estimate and interpret cost information?

An overreliance on the unit cost in this situation could lead to insufficient cash being available to pay the company's costs if volume declines to 200,000 units. As the table indicates, for making this decision, managers should think in terms of total variable costs, total fixed costs, and total costs rather than unit cost. As a general rule, first calculate total costs, then compute the unit cost, if it is needed for a particular decision.

LEARNING OBJECTIVE 5

Distinguish inventoriable costs

... assets when incurred, then cost of goods sold

from period costs

... expenses of the period when incurred

Business Sectors, Types of Inventory, Inventoriable Costs, and Period Costs

In this section, we describe the different sectors of the economy, the different types of inventory that companies hold, and how these factors affect commonly used classifications of inventoriable and period costs.

Manufacturing-, Merchandising-, and Service-Sector Companies

We define three sectors of the economy and provide examples of companies in each sector.

1. **Manufacturing-sector companies** purchase materials and components and convert them into various finished goods. Examples are automotive companies such as Jaguar, cellular-phone producers such as Samsung, food-processing companies such as Heinz, and computer companies such as Lenovo.
2. **Merchandising-sector companies** purchase and then sell tangible products without changing their basic form. This sector includes companies engaged in retailing (for example, bookstores such as Barnes & Noble and department stores such as Target); distribution (for example, a supplier of hospital products, such as Owens and Minor); or wholesaling (for example, a supplier of electronic components such as Arrow Electronics).
3. **Service-sector companies** provide services (intangible products)—for example, legal advice or audits—to their customers. Examples are law firms such as Wachtell, Lipton, Rosen & Katz; accounting firms such as Ernst & Young; banks such as Barclays; mutual fund companies such as Fidelity; insurance companies such as Aetna; transportation companies such as Singapore Airlines; advertising agencies such as Saatchi & Saatchi; television stations such as Turner Broadcasting; Internet service providers such as Comcast; travel agencies such as American Express; and brokerage firms such as Merrill Lynch.

Types of Inventory

Manufacturing-sector companies purchase materials and components and convert them into finished goods. These companies typically have one or more of the following three types of inventory:

1. **Direct materials inventory.** Direct materials in stock that will be used in the manufacturing process (for example, computer chips and components needed to manufacture cellular phones).
2. **Work-in-process inventory.** Goods partially worked on but not yet completed (for example, cellular phones at various stages of completion in the manufacturing process). This is also called **work in progress**.
3. **Finished-goods inventory.** Goods (for example, cellular phones) completed, but not yet sold.

Merchandising-sector companies purchase tangible products and then sell them without changing their basic form. These companies hold only one type of inventory, which is products in their original purchased form, called *merchandise inventory*. Service-sector companies provide only services or intangible products and do not hold inventories of tangible products.

Commonly Used Classifications of Manufacturing Costs

Three terms commonly used when describing manufacturing costs are *direct materials costs*, *direct manufacturing labor costs*, and *indirect manufacturing costs*. These terms build on the direct versus indirect cost distinction we described earlier in the context of manufacturing costs.

1. **Direct materials costs** are the acquisition costs of all materials that eventually become part of the cost object (work in process and then finished goods) and can be traced to the cost object in an economically feasible way. The steel and tires used to make the BMW X6 and the computer chips used to make cellular phones are examples of direct material costs. Note that the costs of direct materials include not only the cost of the materials themselves, but the freight-in (inward delivery) charges, sales taxes, and customs duties that must be paid to acquire them.
2. **Direct manufacturing labor costs** include the compensation of all manufacturing labor that can be traced to the cost object (work in process and then finished goods) in an economically feasible way. Examples include wages and fringe benefits paid to machine operators and assembly-line workers who convert direct materials to finished goods.
3. **Indirect manufacturing costs** are all manufacturing costs that are related to the cost object (work in process and then finished goods), but cannot be traced to that cost object in an economically feasible way. Examples include supplies, indirect materials such as lubricants, indirect manufacturing labor such as plant maintenance and cleaning labor, plant rent, plant insurance, property taxes on the plant, plant depreciation, and the compensation of plant managers. This cost category is also referred to as **manufacturing overhead costs** or **factory overhead costs**. We use *indirect manufacturing costs* and *manufacturing overhead costs* interchangeably in this book.

We now describe the distinction between inventoriable costs and period costs.

Inventoriable Costs

Inventoriable costs are all costs of a product that are considered assets in a company's balance sheet when the costs are incurred and that are expensed as cost of goods sold only when the product is sold. For manufacturing-sector companies, all manufacturing costs are inventoriable costs. The costs first accumulate as work-in-process inventory assets (in other words, they are "inventoried") and then as finished goods inventory assets. Consider Cellular Products, a manufacturer of cellular phones. The cost of the company's direct materials, such as computer chips, direct manufacturing labor costs, and manufacturing overhead costs create new assets. They start out as work-in-process inventory and become finished-goods inventory (the cellular phones). When the cellular phones are sold, the costs move from being assets to cost of goods sold expense. This cost is matched against **revenues**, which are inflows of assets (usually cash or accounts receivable) received for products or services customers purchase.

Note that the cost of goods sold includes all manufacturing costs (direct materials, direct manufacturing labor, and manufacturing overhead costs) incurred to produce them. The cellular phones may be sold during a different accounting period than the period in which they were manufactured. Thus, inventorying manufacturing costs in the balance sheet during the accounting period when the phones are manufactured and expensing the manufacturing costs in a later income statement when the phones are sold matches revenues and expenses.

For merchandising-sector companies such as Walmart, inventoriable costs are the costs of purchasing goods that are resold in their same form. These costs are made up of the costs of the goods themselves plus any incoming freight, insurance, and handling costs for those goods. Service-sector companies provide only services or intangible products. The absence of inventories of tangible products for sale means service-sector companies have no inventoriable costs.

Period Costs

Period costs are all costs in the income statement other than cost of goods sold. Period costs, such as design costs, marketing, distribution, and customer service costs, are treated as expenses of the accounting period in which they are incurred because managers expect these

EXHIBIT 2-6

Examples of Period Costs in Combinations of the Direct/Indirect and Variable/Fixed Cost Classifications at a Bank

		Assignment of Costs to Cost Object	
		Direct Costs	Indirect Costs
Cost-Behavior Pattern	Variable Costs	- Cost object: Number of mortgage loans - Example: Fees paid to property appraisal company for each mortgage loan	- Cost object: Number of mortgage loans - Example: Postage paid to deliver mortgage-loan documents to lawyers/homeowners
	Fixed Costs	- Cost object: Number of mortgage loans - Example: Salary paid to executives in mortgage loan department to develop new mortgage-loan products	- Cost object: Number of mortgage loans - Example: Cost to the bank of sponsoring annual golf tournament

costs to increase revenues in only that period and not in future periods. For manufacturing-sector companies, all nonmanufacturing costs in the income statement are period costs. For merchandising-sector companies, all costs in the income statement not related to the cost of goods purchased for resale are period costs. Examples of these period costs are labor costs of sales-floor personnel and advertising costs. Because there are no inventoriable costs for service-sector companies, all costs in the income statement are period costs.

An interesting question pertains to the treatment of R & D expenses as period costs.² As we saw in Chapter 1, for many companies in industries ranging from machine tools to consumer electronics to telecommunications to pharmaceuticals and biotechnology, innovation is increasingly becoming a key driver of success. The benefits of these innovations and R & D investments will, in most cases, only impact revenues in some future periods. So should R&D expenses still be considered period costs and be matched against revenues of the current period? Yes, because it is highly uncertain whether these innovations will be successful and result in future revenues. Even if the innovations are successful, it is very difficult to determine which future period the innovations will benefit. Some managers believe that treating R & D expenses as period costs dampens innovation because it reduces current period income.

Exhibit 2-5 showed examples of inventoriable costs in direct/indirect and variable/fixed cost classifications for a car manufacturer. Exhibit 2-6 shows examples of period costs in direct/indirect and variable/fixed cost classifications at a bank.

DECISION POINT

What are the differences in the accounting for inventoriable versus period costs?

LEARNING OBJECTIVE 6

Illustrate the flow of inventoriable and period costs

...in manufacturing settings, inventoriable costs flow through work-in-process and finished-goods accounts and are expensed when goods are sold; period costs are expensed as incurred

Illustrating the Flow of Inventoriable Costs and Period Costs

We illustrate the flow of inventoriable costs and period costs through the income statement of a manufacturing company, where the distinction between inventoriable costs and period costs is most detailed.

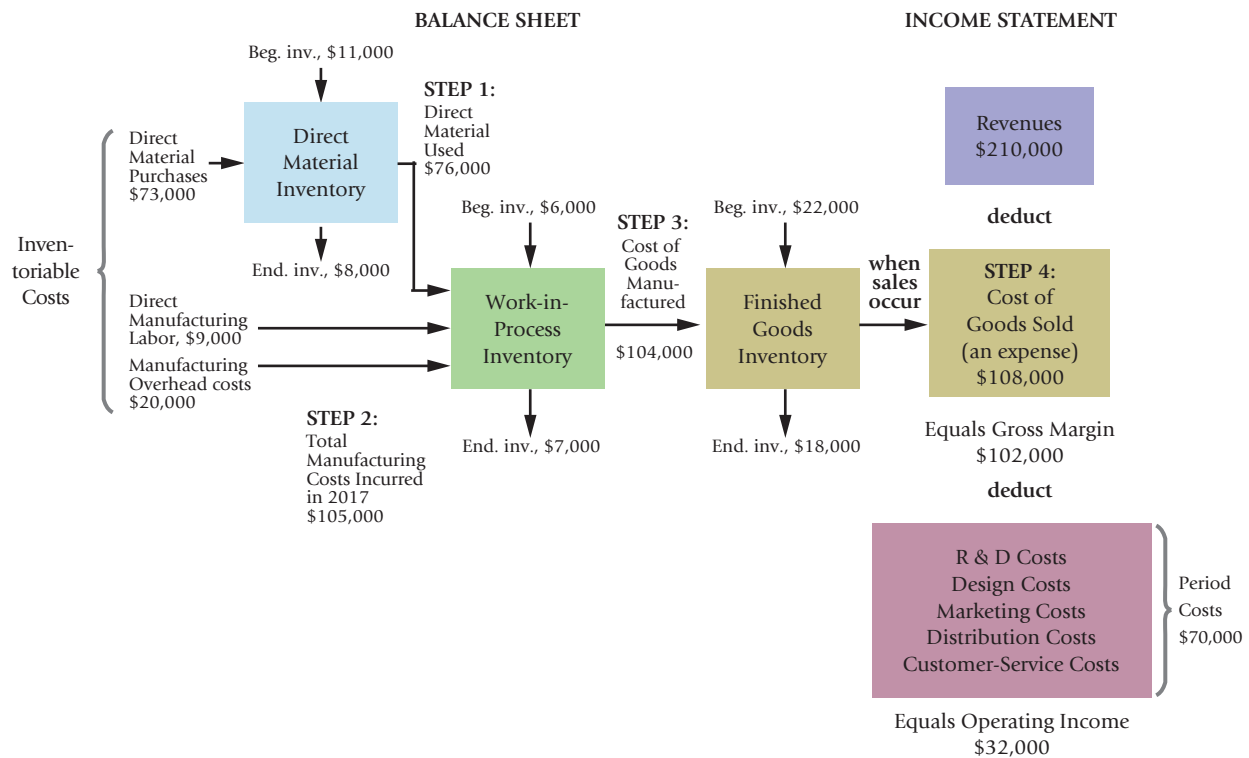
Manufacturing-Sector Example

Follow the flow of costs for Cellular Products in Exhibits 2-7 and 2-8. Exhibit 2-7 visually highlights the differences in the flow of inventoriable and period costs for a manufacturing-sector company. Note how, as described in the previous section, inventoriable costs go through

² Under Generally Accepted Accounting Principles (GAAP) in the U.S., all R & D costs are expensed for financial accounting. International Financial Reporting Standards (IFRS) permit the capitalization of some development costs for financial accounting.

EXHIBIT 2-7

Flow of Revenue and Costs for a Manufacturing-Sector Company, Cellular Products
(in thousands)



the balance sheet accounts of work-in-process inventory and finished-goods inventory before entering the cost of goods sold in the income statement. Period costs are expensed directly in the income statement. Exhibit 2-8 takes the visual presentation in Exhibit 2-7 and shows how inventoriable costs and period expenses would appear in the income statement and schedule of cost of goods manufactured of a manufacturing company.

We start by tracking the flow of direct materials shown on the left in Exhibit 2-7 and in Panel B in Exhibit 2-8. To keep things simple, all numbers are expressed in thousands, except for the per unit amounts.

Step 1: Cost of direct materials used in 2017. Note how the arrows in Exhibit 2-7 for beginning inventory, \$11,000, and direct material purchases, \$73,000, “fill up” the direct materials inventory box and how direct materials used, \$76,000, “empties out” direct material inventory, leaving an ending inventory of direct materials of \$8,000 that becomes the beginning inventory for the next year.

The cost of direct materials used is calculated in Exhibit 2-8, Panel B (light blue-shaded area), as follows:

Beginning inventory of direct materials, January 1, 2017	\$11,000
+ Purchases of direct materials in 2017	73,000
— Ending inventory of direct materials, December 31, 2017	8,000
= Direct materials used in 2017	<u>\$76,000</u>

Step 2: Total manufacturing costs incurred in 2017. Total manufacturing costs refers to all direct manufacturing costs and manufacturing overhead costs incurred during 2017 for all goods worked on during the year. Cellular Products classifies its manufacturing costs into the three categories described earlier.

(i) Direct materials used in 2017 (shaded light blue in Exhibit 2-8, Panel B)	\$ 76,000
(ii) Direct manufacturing labor in 2017 (shaded blue in Exhibit 2-8, Panel B)	9,000
(iii) Manufacturing overhead costs in 2017 (shaded dark blue in Exhibit 2-8, Panel B)	20,000
Total manufacturing costs incurred in 2017	<u>\$105,000</u>

Note how in Exhibit 2-7 these costs increase work-in-process inventory.

Diana Corporation provides the following information for 2017:

Beginning inventory of direct materials, 1/1/2017	\$12,000
Purchases of direct materials in 2017	\$85,000
Ending inventory of direct materials 12/31/2017	\$ 7,000
Direct manufacturing labor costs in 2017	\$30,000
Manufacturing overhead costs in 2017	\$40,000

Calculate the total manufacturing costs incurred in 2017

2-2 TRY IT!

Step 3: Cost of goods manufactured in 2017. Cost of goods manufactured refers to the cost of goods brought to completion, whether they were started before or during the current accounting period.

Note how the work-in-process inventory box in Exhibit 2-7 has a very similar structure to the direct materials inventory box described in Step 1. Beginning work-in-process inventory of \$6,000 and total manufacturing costs incurred in 2017 of \$105,000 “fill up” the work-in-process inventory box. Some of the manufacturing costs incurred during 2017 are held back as the cost of the ending work-in-process inventory. The ending work-in-process inventory of \$7,000 becomes the beginning inventory for the next year, and the \$104,000 cost of goods manufactured during 2017 “empties out” the work-in-process inventory while “filling up” the finished-goods inventory box.

The cost of goods manufactured in 2017 (shaded green) is calculated in Exhibit 2-8, Panel B, as follows:

Beginning work-in-process inventory, January 1, 2017	\$ 6,000
+ Total manufacturing costs incurred in 2017	105,000
= Total manufacturing costs to account for	111,000
– Ending work-in-process inventory, December 31, 2017	7,000
= Cost of goods manufactured in 2017	<u>\$104,000</u>

Step 4: Cost of goods sold in 2017. The cost of goods sold is the cost of finished-goods inventory sold to customers during the current accounting period. Looking at the finished-goods inventory box in Exhibit 2-7, we see that the beginning inventory of finished goods of \$22,000 and cost of goods manufactured in 2017 of \$104,000 “fill up” the finished-goods inventory box. The ending inventory of finished goods of \$18,000 becomes the beginning inventory for the next year, and the \$108,000 cost of goods sold during 2017 “empties out” the finished-goods inventory.

This cost of goods sold is an expense that is matched against revenues. The cost of goods sold for Cellular Products (shaded olive green) is computed in Exhibit 2-8, Panel A, as follows:

Beginning inventory of finished goods, January 1, 2017	\$ 22,000
+ Cost of goods manufactured in 2017	104,000
– Ending inventory of finished goods, December 31, 2017	18,000
= Cost of goods sold in 2017	<u>\$108,000</u>

Exhibit 2-9 shows related general ledger T-accounts for Cellular Products’ manufacturing cost flow. Note how the cost of goods manufactured (\$104,000) is the cost of all goods completed during the accounting period. These costs are all inventoriable costs. Goods completed during the period are transferred to finished-goods inventory. These costs become cost of goods sold in the accounting period when the goods are sold. Also note that the direct materials, direct manufacturing labor, and manufacturing overhead costs of the units in work-in-process inventory (\$7,000) and finished-goods inventory (\$18,000) as of December 31, 2017, will appear as an asset in the balance sheet. These costs will become expenses next year when the work-in-process inventory is converted to finished goods and the finished goods are sold.

EXHIBIT 2-9

General Ledger T-Accounts for Cellular Products' Manufacturing Cost Flow (in thousands)

Work-in-Process Inventory				Finished Goods Inventory				Cost of Goods Sold	
Bal. Jan. 1, 2017	6,000	Cost of goods manufactured	104,000	Bal. Jan. 1, 2017	22,000	Cost of goods sold	108,000	108,000	
Direct materials used	76,000				104,000				
Direct manuf. labor	9,000			Bal. Dec. 31, 2017	18,000				
Indirect manuf. costs	20,000								
Bal. Dec. 31, 2017	7,000								

TRY IT! 2-3

Diana Corporation provides the following information for 2017:

Beginning work-in-process inventory, 1/1/2017	\$ 9,000
Total manufacturing costs incurred in 2017	\$160,000
Ending work-in-process inventory, 12/31/2017	\$ 8,000
Beginning inventory of finished goods, 1/1/2017	\$ 15,000
Ending inventory of finished goods, 12/31/2017	\$ 21,000

Calculate (a) Cost of goods manufactured in 2017 and (b) Cost of goods sold in 2017

We can now prepare Cellular Products' income statement for 2017. The income statement of Cellular Products is shown on the right side in Exhibit 2-7 and in Exhibit 2-8, Panel A. Revenues of Cellular Products are (in thousands) \$210,000. Inventoriable costs expensed during 2017 equal cost of goods sold of \$108,000.

$$\text{Gross margin} = \text{Revenues} - \text{Cost of goods sold} = \$210,000 - \$108,000 = \$102,000.$$

The \$70,000 of operating costs composed of R&D, design, marketing, distribution, and customer-service costs are period costs of Cellular Products. These period costs include, for example, salaries of salespersons, depreciation on computers and other equipment used in marketing, and the cost of leasing warehouse space for distribution. **Operating income** equals total revenues from operations minus cost of goods sold and operating (period) costs (excluding interest expense and income taxes) or, equivalently, gross margin minus period costs. The operating income of Cellular Products is \$32,000 (gross margin, \$102,000 – period costs, \$70,000). If you are familiar with financial accounting, recall that period costs are typically called selling, general, and administrative expenses in the income statement.

Newcomers to cost accounting frequently assume that indirect costs such as rent, telephone, and depreciation are always costs of the period in which they are incurred and are not associated with inventories. When these costs are incurred in marketing or in corporate headquarters, they are period costs. However, when these costs are incurred in manufacturing, they are manufacturing overhead costs and are inventoriable.

Because costs that are inventoried are not expensed until the units associated with them are sold, a manager can produce more units than are expected to be sold in a period without reducing a firm's net income. In fact, building up inventory in this way defers the expensing of the current period's fixed manufacturing costs as manufacturing costs are inventoried and not expensed until the units are sold in a subsequent period. This in turn actually *increases* the firm's gross margin and operating income even though there is no increase in sales, causing outsiders to believe that the company is more profitable than it actually is. We will discuss this risky accounting practice in greater detail in Chapter 9.

Recap of Inventoriable Costs and Period Costs

Exhibit 2-7 highlights the differences between inventoriable costs and period costs for a manufacturing company. The manufacturing costs of finished goods include direct materials, direct

manufacturing labor, and manufacturing overhead costs such as supervision, production control, and machine maintenance. All these costs are inventoriable: They are assigned to work-in-process inventory until the goods are completed and then to finished-goods inventory until the goods are sold. All nonmanufacturing costs, such as R&D, design, and distribution costs, are period costs.

Inventoriable costs and period costs flow through the income statement at a merchandising company similar to the way costs flow at a manufacturing company. At a merchandising company, however, the flow of costs is much simpler to understand and track. Exhibit 2-10 shows the inventoriable costs and period costs for a retailer or wholesaler, which buys goods for resale. The only inventoriable cost is the cost of merchandise. (This corresponds to the cost of finished goods manufactured for a manufacturing company.) Purchased goods are held as merchandise inventory, the cost of which is shown as an asset in the balance sheet. As the goods are sold, their costs are shown in the income statement as cost of goods sold. A retailer or wholesaler also has a variety of marketing, distribution, and customer-service costs, which are period costs. In the income statement, period costs are deducted from revenues without ever having been included as part of inventory.

DECISION POINT

What is the flow of inventoriable and period costs in manufacturing and merchandising settings?

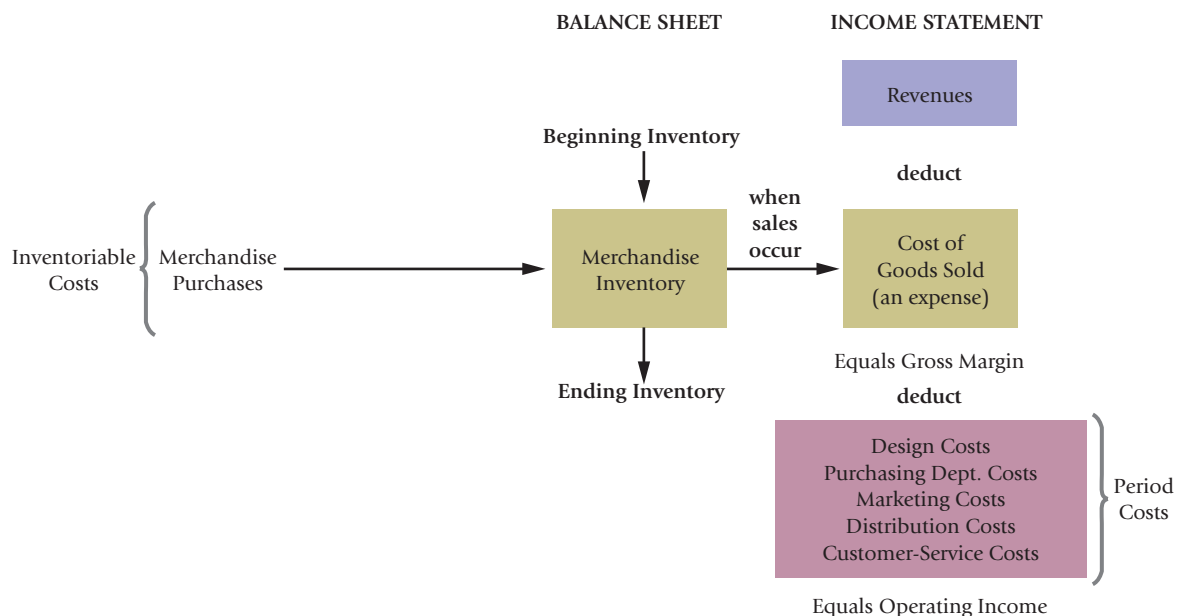
Prime Costs and Conversion Costs

Two terms used to describe cost classifications in manufacturing costing systems are *prime costs* and *conversion costs*. **Prime costs** are all direct manufacturing costs. For Cellular Products,

$$\text{Prime costs} = \text{Direct material costs} + \text{Direct manufacturing labor costs} = \$76,000 + \$9,000 = \$85,000$$

As we have already discussed, the greater the proportion of prime costs (or direct costs) to total costs, the more confident managers can be about the accuracy of the costs of products. As information-gathering technology improves, companies can add more and more direct-cost categories. For example, power costs might be metered in specific areas of a plant and identified as a direct cost of specific products. Furthermore, if a production line were dedicated to manufacturing a specific product, the depreciation on the production equipment would be a direct manufacturing cost and would be included in prime costs. Computer software companies often have a “purchased technology” direct manufacturing cost item. This item, which represents payments to suppliers who develop software algorithms for a product, is also included in prime costs. **Conversion costs** are all manufacturing costs other than direct

EXHIBIT 2-10 Flow of Revenues and Costs for a Merchandising Company (Retailer or Wholesaler)



material costs. Conversion costs represent all manufacturing costs incurred to convert direct materials into finished goods. For Cellular Products,

$$\text{Conversion costs} = \frac{\text{Direct manufacturing labor costs}}{\text{Direct manufacturing labor costs}} + \frac{\text{Manufacturing overhead costs}}{\text{Manufacturing overhead costs}} = \$9,000 + \$20,000 = \$29,000$$

Note that direct manufacturing labor costs are a part of both prime costs and conversion costs.

Some manufacturing operations, such as computer-integrated manufacturing (CIM) plants, have very few workers. The workers' roles are to monitor the manufacturing process and to maintain the equipment that produces multiple products. The costing systems in CIM plants do not have a direct manufacturing labor cost category because direct manufacturing labor cost is relatively small and because it is difficult to trace this cost to products. In a CIM plant, the only prime cost is the cost of direct materials. The conversion costs for such a plant are largely manufacturing overhead costs.

LEARNING OBJECTIVE 7

Explain why product costs are computed in different ways for different purposes

...examples are pricing and product-mix decisions, government contracts, and financial statements

Measuring Costs Requires Judgment

Measuring costs requires judgment. That's because there are alternative ways for managers to define and classify costs. Different companies or sometimes even different subunits within the same company may define and classify costs differently. Be careful to define and understand the ways costs are measured in a company or situation. We first illustrate this point for labor costs.

Measuring Labor Costs

Consider labor costs for software programming at companies such as Apple, where programmers work on different software applications for products like the iMac, the iPad, and the iPhone. Although labor cost classifications vary among companies, many companies use multiple labor cost categories:

- Direct programming labor costs that can be traced to individual products
- Overhead costs (labor related)
 - Indirect labor compensation for
 - Office staff
 - Office security
 - Rework labor (time spent by direct laborers correcting software errors)
 - Overtime premium paid to software programmers (explained next)
 - Idle time (explained next)
 - Salaries for managers, department heads, and supervisors
 - Payroll fringe costs, for example, health care premiums and pension costs (explained later)

To retain information on different categories, *indirect labor costs* are commonly divided into many subclassifications, for example, office staff and idle time costs. Note that managers' salaries usually are not classified as indirect labor costs. Instead, the compensation of supervisors, department heads, and all others who are regarded as management is placed in a separate classification of labor-related overhead.

Overtime Premium and Idle Time

Managers need to pay special attention to two classes of indirect labor—overtime premium and idle time. **Overtime premium** is the wage rate paid to workers (for both direct labor and indirect labor) in *excess* of their straight-time wage rates. Overtime premium is usually considered to be a part of indirect costs or overhead. Consider the example of George Flexner, a junior software programmer who writes software for multiple products. He is paid \$40 per hour for straight-time and \$60 per hour (time and a half) for overtime. His overtime premium

is \$20 per overtime hour. If he works 44 hours, including 4 overtime hours, in one week, his gross compensation would be classified as follows:

Direct programming labor: 44 hours × \$40 per hour	\$1,760
Overtime premium: 4 hours × \$20 per hour	80
Total compensation for 44 hours	<u>\$1,840</u>

In this example, why is the overtime premium of direct programming labor usually considered an overhead cost rather than a direct cost? After all, the premium can be traced to specific products that George worked on while working overtime. Overtime premium is generally not considered a direct cost because the particular job that George worked on during the overtime hours is a matter of chance. For example, assume that George worked on two products for 5 hours each on a specific workday that lasted 10 hours, including 2 overtime hours. Should the product George worked on during hours 9 and 10 be assigned the overtime premium? Or should the premium be prorated over both products? Prorating the overtime premium does not “penalize”—add to the cost of—a particular product solely because it happened to be worked on during the overtime hours. *Instead, the overtime premium is considered to be attributable to the heavy overall volume of work. Its cost is regarded as part of overhead, which is borne by both products.*

Sometimes, though, overtime can definitely be attributed to a single product. For example, the overtime needed to meet the launch deadline for a new product may clearly be the sole source of overtime. In such instances, the overtime premium is regarded as a direct cost of that product.

Another subclassification of indirect labor is the idle time of both direct and indirect labor. **Idle time** refers to the wages paid for unproductive time caused by lack of orders, machine or computer breakdowns, work delays, poor scheduling, and the like. For example, if George had no work for 3 hours during that week while waiting to receive code from another colleague, George’s earnings would be classified as follows:

Direct programming labor: 41 hours × \$40/hour	\$1,640
Idle time (overhead): 3 hours × \$40/hour	120
Overtime premium (overhead): 4 hours × \$20/hour	80
Total earnings for 44 hours	<u>\$1,840</u>

Clearly, in this case, the idle time is not related to a particular product, nor, as we have already discussed, is the overtime premium. Both the overtime premium and the costs of idle time are considered overhead costs.

Benefits of Defining Accounting Terms

Managers, accountants, suppliers, and others will avoid many problems if they thoroughly understand and agree on the classifications and meanings of the cost terms introduced in this chapter and later in this book. Consider the classification of programming labor *payroll fringe costs*, which include employer payments for employee benefits such as Social Security, life insurance, health insurance, and pensions. Consider, for example, a software programmer who is paid a wage of \$40 an hour with fringe benefits totaling, say, \$10 per hour. Some companies classify the \$40 as a direct programming labor cost of the product for which the software is being written and the \$10 as overhead cost. Other companies classify the entire \$50 as direct programming labor cost. The latter approach is preferable because the stated wage and the fringe benefit costs together are a fundamental part of acquiring direct software programming labor services.

Caution: In every situation, it is important for managers and management accountants to pinpoint clearly what direct labor includes and what direct labor excludes. This clarity will help prevent disputes regarding cost-reimbursement contracts, income tax payments, and labor union matters, which often can take a substantial amount of time for managers to resolve. Consider that some countries, such as Costa Rica and Mauritius, offer substantial income tax savings to foreign companies that generate employment within their borders. In some cases,

to qualify for the tax benefits, the direct labor costs must at least equal a specified percentage of a company's total costs.

When managers do not precisely define direct labor costs, disputes can arise about whether payroll fringe costs should be included as part of direct labor costs when calculating the direct labor percentage for qualifying for such tax benefits. Companies have sought to classify payroll fringe costs as part of direct labor costs to make direct labor costs a higher percentage of total costs. Tax authorities have argued that payroll fringe costs are part of overhead. In addition to payroll fringe costs, other debated items are compensation for training time, idle time, vacations, sick leave, and overtime premium. To prevent disputes, contracts and laws should be as specific as possible about accounting definitions and measurements.

Different Meanings of Product Costs

At a more general level, many cost terms used by organizations have ambiguous meanings. Consider the term *product cost*. A **product cost** is the sum of the costs assigned to a product for a specific purpose. Different purposes can result in different measures of product cost, as the brackets on the value chain in Exhibit 2-11 illustrate:

- **Pricing and product-mix decisions.** For the purposes of making decisions about pricing and promoting products that generate the most profits, managers are interested in the overall (total) profitability of different products and, consequently, assign costs incurred in all business functions of the value chain to the different products.
- **Reimbursement under government contracts.** Government contracts often reimburse contractors on the basis of the “cost of a product” plus a prespecified margin of profit. A contract such as this is referred to as a “cost-plus” agreement. Cost-plus agreements are typically used for services and development contracts when it is not easy to predict the amount of money required to design, fabricate, and test items. Because these contracts transfer the risk of cost overruns to the government, agencies such as the Department of Defense and the Department of Energy provide detailed guidelines on the cost items they will allow (and disallow) when calculating the cost of a product. For example, many government agencies explicitly exclude marketing, distribution, and customer-service costs from product costs that qualify for reimbursement, and they may only partially reimburse R&D costs. These agencies want to reimburse contractors for only those costs most closely related to delivering products under the contract. The second bracket in Exhibit 2-11 shows how the product-cost calculations for a specific contract may allow for all design and production costs but only part of R&D costs.

EXHIBIT 2-11

Different Product Costs
for Different Purposes

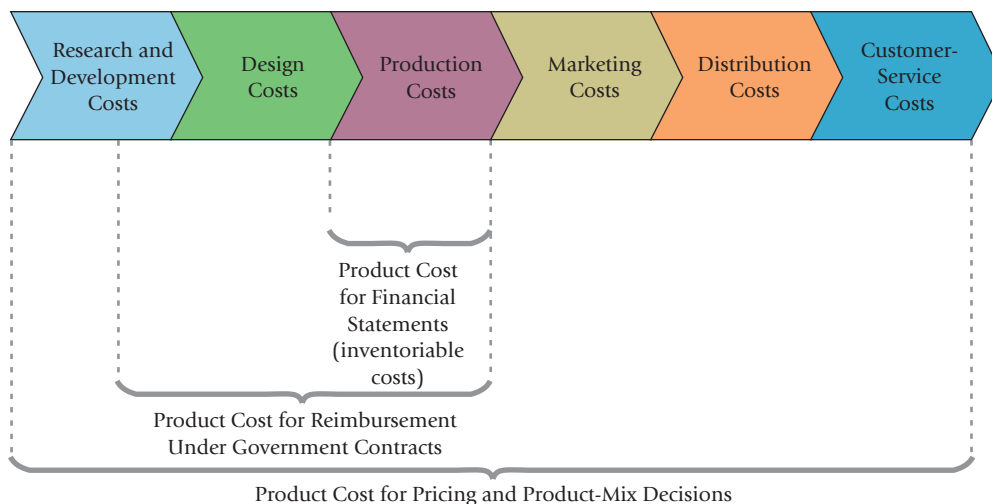


EXHIBIT 2-12**Alternative
Classifications of Costs**

- | | |
|-------------------------------------|--|
| 1. Business function | 3. Behavior pattern in relation to the level of activity or volume |
| a. Research and development | a. Variable cost |
| b. Design of products and processes | b. Fixed cost |
| c. Production | 4. Aggregate or average |
| d. Marketing | a. Total cost |
| e. Distribution | b. Unit cost |
| f. Customer service | 5. Assets or expenses |
| 2. Assignment to a cost object | a. Inventoriable cost |
| a. Direct cost | b. Period cost |
| b. Indirect cost | |

- **Preparing financial statements for external reporting under Generally Accepted Accounting Principles (GAAP).** Under GAAP, only manufacturing costs can be assigned to inventories in the financial statements. For the purposes of calculating inventory costs, product costs include only inventoriable (production) costs.

As Exhibit 2-11 illustrates, product-cost measures range from a narrow set of costs for financial statements—a set that includes only production costs—to a broader set of costs for reimbursement under government contracts to a still broader set of costs for pricing and product-mix decisions.

This section focused on how different purposes result in the inclusion of different cost items of the value chain of business functions when product costs are calculated. The same caution about the need to be clear and precise about cost concepts and their measurement applies to each cost classification introduced in this chapter. Exhibit 2-12 summarizes the key cost classifications. Using the five-step process described in Chapter 1, think about how these different classifications of costs help managers make decisions and evaluate performance.

1. **Identify the problem and uncertainties.** Consider a decision about how much to price a product. This decision often depends on how much it costs to make the product.
2. **Obtain information.** Managers identify the direct and indirect costs of a product in each business function. Managers also gather other information about customers, competitors, and the prices of competing products.
3. **Make predictions about the future.** Managers estimate what it will cost to make the product in the future. This requires managers to predict the quantity of the product they expect the company to sell as well as have an understanding of fixed and variable costs.
4. **Make decisions by choosing among alternatives.** Managers choose a price to charge based on a thorough understanding of costs and other information.
5. **Implement the decision, evaluate performance, and learn.** Managers control costs and learn by comparing the actual total and unit costs against budgeted amounts.

The next section describes how the basic concepts introduced in this chapter lead to a framework for understanding cost accounting and cost management that can then be applied to the study of many topics, such as strategy evaluation, quality, and investment decisions.

A Framework for Cost Accounting and Cost Management

The following three features of cost accounting and cost management can be used for a wide range of applications:

1. Calculating the cost of products, services, and other cost objects
2. Obtaining information for planning and control and performance evaluation
3. Analyzing the relevant information for making decisions

DECISION POINT

Why do managers assign different costs to the same cost object?

LEARNING OBJECTIVE

8

Describe a framework for cost accounting and cost management

... three features that help managers make decisions

We develop these ideas in Chapters 3 through 11. The ideas also form the foundation for the study of various topics later in the book.

Calculating the Cost of Products, Services, and Other Cost Objects

You have already learned that costing systems trace direct costs and allocate indirect costs to products. Chapters 4 and 5 describe systems such as job costing and activity-based costing, which are used to calculate total costs and unit costs of products and services. The chapters also discuss how managers use this information to formulate strategies and make pricing, product-mix, and cost-management decisions.

Obtaining Information for Planning and Control and Performance Evaluation

Budgeting is the most commonly used tool for planning and control. A budget forces managers to look ahead, to translate a company's strategy into plans, to coordinate and communicate within the organization, and to provide a benchmark for evaluating the company's performance. Managers strive to meet their budget targets, so budgeting often affects the behavior of a company's personnel and the decisions they make. Chapter 6 describes budgeting systems.

At the end of a reporting period, managers compare the company's actual results to its planned performance. The managers' tasks are to understand why differences (called variances) between actual and planned performance arise and to use the information provided by these variances as feedback to promote learning and future improvement. Managers also use variances as well as nonfinancial measures, such as defect rates and customer satisfaction ratings, to control and evaluate the performance of various departments, divisions, and managers. Chapters 7 and 8 discuss variance analysis. Chapter 9 describes planning, control, and inventory-costing issues relating to capacity. Chapters 6, 7, 8, and 9 focus on the management accountant's role in implementing strategy.

Analyzing the Relevant Information for Making Decisions

When designing strategies and implementing them, managers must understand which revenues and costs to consider and which ones to ignore. Management accountants help managers identify what information is relevant and what information is irrelevant. Consider a decision about whether to buy a product from an outside vendor or make it in-house. The costing system indicates that it costs \$25 per unit to make the product in-house. A vendor offers to sell the product for \$22 per unit. At first glance, it seems it will cost less for the company to buy the product rather than make it. Suppose, however, that of the \$25 to make the product in-house, \$5 consists of plant lease costs that the company has already paid under a lease contract. Furthermore, if the product is bought, the plant will remain idle because it is too costly to retool the plant to make another product. That is, there is no opportunity to use the plant in some other profitable way. Under these conditions, it will cost less to make the product than to buy it. That's because making the product costs only an *additional* \$20 per unit ($\$25 - \5), compared with an *additional* \$22 per unit if it is bought. The \$5 per unit of lease cost is irrelevant to the decision because it is a *past* (or *sunk*) cost that has already been incurred regardless of whether the product is made or bought. Analyzing relevant information is a key aspect of making decisions.

When making strategic decisions about which products and how much to produce, managers must know how revenues and costs vary with changes in output levels. For this purpose, managers need to distinguish fixed costs from variable costs. Chapter 3 analyzes how operating income changes with changes in units sold and how managers use this information to make decisions such as how much to spend on advertising. Chapter 10 describes methods to estimate the fixed and variable components of costs. Chapter 11 applies the concept of relevance to decision making in many different situations and describes methods managers use to maximize income given the resource constraints they face.

Later chapters in the book discuss topics such as strategy evaluation, customer profitability, quality, just-in-time systems, investment decisions, transfer pricing, and performance evaluation. Each of these topics invariably has product costing, planning and control, and decision-making perspectives. A command of the first 11 chapters will help you master these topics. For example, Chapter 12 on strategy describes the balanced scorecard, a set of financial and nonfinancial measures used to implement strategy that builds on the planning and control functions. The section on strategic analysis of operating income builds on ideas of product costing and variance analysis. The section on downsizing and managing capacity builds on ideas of relevant revenues and relevant costs.

DECISION POINT

What are the three key features of cost accounting and cost management?

PROBLEM FOR SELF-STUDY

Foxwood Company is a metal- and woodcutting manufacturer, selling products to the home-construction market. Consider the following data for 2017:

Sandpaper	\$ 2,000
Materials-handling costs	70,000
Lubricants and coolants	5,000
Miscellaneous indirect manufacturing labor	40,000
Direct manufacturing labor	300,000
Direct materials inventory, Jan. 1, 2017	40,000
Direct materials inventory, Dec. 31, 2017	50,000
Finished-goods inventory, Jan. 1, 2017	100,000
Finished-goods inventory, Dec. 31, 2017	150,000
Work-in-process inventory, Jan. 1, 2017	10,000
Work-in-process inventory, Dec. 31, 2017	14,000
Plant-leasing costs	54,000
Depreciation—plant equipment	36,000
Property taxes on plant equipment	4,000
Fire insurance on plant equipment	3,000
Direct materials purchased	460,000
Revenues	1,360,000
Marketing promotions	60,000
Marketing salaries	100,000
Distribution costs	70,000
Customer-service costs	100,000

1. Prepare an income statement with a separate supporting schedule of cost of goods manufactured. For all manufacturing items, classify costs as direct costs or indirect costs and indicate by V or F whether each is a variable cost or a fixed cost (when the cost object is a product unit). If in doubt, decide on the basis of whether the total cost will change substantially over a wide range of units produced.
2. Suppose that both the direct material costs and the plant-leasing costs are for the production of 900,000 units. What is the direct material cost of each unit produced? What is the plant-leasing cost per unit? Assume that the plant-leasing cost is a fixed cost.
3. Suppose Foxwood Company manufactures 1,000,000 units next year. Repeat the computation in requirement 2 for direct materials and plant-leasing costs. Assume the implied cost-behavior patterns persist.
4. As a management consultant, explain concisely to the company president why the unit cost for direct materials did not change in requirements 2 and 3 but the unit cost for plant-leasing costs did change.

Required

Solution

1.

**Foxwood Company
Income Statement**

For the Year Ended December 31, 2017

Revenues		\$ 1,360,000
Cost of goods sold		
Beginning finished-goods inventory, January 1, 2017	\$ 100,000	
Cost of goods manufactured (see the following schedule)	<u>960,000</u>	
Cost of goods available for sale	1,060,000	
Deduct ending finished-goods inventory, December 31, 2017	<u>150,000</u>	<u>910,000</u>
Gross margin (or gross profit)		450,000
Operating costs		
Marketing promotions	60,000	
Marketing salaries	100,000	
Distribution costs	70,000	
Customer-service costs	<u>100,000</u>	<u>330,000</u>
Operating income		<u>\$ 120,000</u>

**Foxwood Company
Schedule of Cost of Goods Manufactured**

For the Year Ended December 31, 2017

Direct materials		
Beginning inventory, January 1, 2017		\$ 40,000
Purchases of direct materials		<u>460,000</u>
Cost of direct materials available for use		500,000
Ending inventory, December 31, 2017		<u>50,000</u>
Direct materials used		450,000 (V)
Direct manufacturing labor		300,000 (V)
Indirect manufacturing costs		
Sandpaper	\$ 2,000 (V)	
Materials-handling costs	70,000 (V)	
Lubricants and coolants	5,000 (V)	
Miscellaneous indirect manufacturing labor	40,000 (V)	
Plant-leasing costs	54,000 (F)	
Depreciation—plant equipment	36,000 (F)	
Property taxes on plant equipment	4,000 (F)	
Fire insurance on plant equipment	<u>3,000 (F)</u>	<u>214,000</u>
Manufacturing costs incurred during 2017		964,000
Beginning work-in-process inventory, January 1, 2017		<u>10,000</u>
Total manufacturing costs to account for		974,000
Ending work-in-process inventory, December 31, 2017		<u>14,000</u>
Cost of goods manufactured (to income statement)		<u>\$ 960,000</u>

2. Direct material unit cost = Direct materials used $\div$ Units produced
 $= \$450,000 \div 900,000 \text{ units} = \0.50 per unit
 Plant-leasing unit cost = Plant-leasing costs $\div$ Units produced
 $= \$54,000 \div 900,000 \text{ units} = \0.06 per unit
3. The direct material costs are variable, so they would increase in total from \$450,000 to \$500,000 ($1,000,000 \text{ units} \times \0.50 per unit). However, their unit cost would be unaffected: $\$500,000 \div 1,000,000 \text{ units} = \0.50 per unit .
 In contrast, the plant-leasing costs of \$54,000 are fixed, so they would not increase in total. However, the plant-leasing cost per unit would decline from \$0.060 to \$0.054: $\$54,000 \div 1,000,000 \text{ units} = \0.054 per unit .
4. The explanation would begin with the answer to requirement 3. As a consultant, you should stress that the unitizing (averaging) of costs that have different behavior patterns can be misleading. A common error is to assume that a total unit cost, which is often a sum of variable unit cost and fixed unit cost, is an indicator that total costs change in proportion to changes in production levels. The next chapter demonstrates the necessity for distinguishing between cost-behavior patterns. You must be wary, especially about average fixed cost per unit. Too often, unit fixed cost is erroneously regarded as being indistinguishable from unit variable cost.

DECISION POINTS

The following question-and-answer format summarizes the chapter's learning objectives. Each decision presents a key question related to a learning objective. The guidelines are the answer to that question.

Decision

1. What is a cost object?
2. How do managers decide whether a cost is a direct or an indirect cost?
3. How do managers decide whether a cost is a variable or a fixed cost?
4. How should managers estimate and interpret cost information?
5. What are the differences in the accounting for inventoriable versus period costs?

Guidelines

A cost object is anything for which a manager needs a separate measurement of cost. Examples include a product, a service, a project, a customer, a brand category, an activity, and a department.

A direct cost is any cost that is related to a particular cost object and can be traced to that cost object in an economically feasible way. Indirect costs are related to a particular cost object but cannot be traced to it in an economically feasible way. The same cost can be direct for one cost object and indirect for another cost object. This book uses *cost tracing* to describe the assignment of direct costs to a cost object and *cost allocation* to describe the assignment of indirect costs to a cost object.

A variable cost changes *in total* in proportion to changes in the related level of total activity or volume of output produced. A fixed cost remains unchanged *in total* for a given time period despite wide changes in the related level of total activity or volume of output produced.

In general, focus on total costs, not unit costs. When making total cost estimates think of variable costs as an amount per unit and fixed costs as a total amount. Interpret the unit cost of a cost object cautiously when it includes a fixed-cost component.

Inventoriable costs are all costs of a product that a company regards as an asset in the accounting period in which they are incurred and which become cost of goods sold in the accounting period in which the product is sold. Period costs are expensed in the accounting period in which they are incurred and are all of the costs in an income statement other than cost of goods sold.

Decision

6. What is the flow of inventoriable and period costs in manufacturing and merchandising settings?
7. Why do managers assign different costs to the same cost objects?
8. What are the three key features of cost accounting and cost management?

Guidelines

In manufacturing settings, inventoriable costs flow through work-in-process and finished-goods accounts, and are expensed as cost of goods sold. Period costs are expensed as they are incurred. In merchandising settings, only the cost of merchandise is treated as inventoriable.

Managers can assign different costs to the same cost object depending on the purpose. For example, for the external reporting purpose in a manufacturing company, the inventoriable cost of a product includes only manufacturing costs. In contrast, costs from all business functions of the value chain often are assigned to a product for pricing and product-mix decisions.

Three features of cost accounting and cost management are (1) calculating the cost of products, services, and other cost objects; (2) obtaining information for planning and control and performance evaluation; and (3) analyzing relevant information for making decisions.

TERMS TO LEARN

This chapter contains more basic terms than any other in this book. Do not proceed before you check your understanding of the following terms. The chapter and the Glossary at the end of the book contain definitions of the following important terms:

actual cost (p. 49)	direct manufacturing labor costs (p. 59)	merchandising-sector companies (p. 58)
average cost (p. 56)	direct materials costs (p. 59)	operating income (p. 64)
budgeted cost (p. 49)	direct materials inventory (p. 58)	overtime premium (p. 66)
conversion costs (p. 65)	factory overhead costs (p. 59)	period costs (p. 59)
cost (p. 49)	finished-goods inventory (p. 58)	prime costs (p. 65)
cost accumulation (p. 49)	fixed cost (p. 52)	product cost (p. 68)
cost allocation (p. 50)	idle time (p. 67)	relevant range (p. 55)
cost assignment (p. 50)	indirect costs of a cost object (p. 50)	revenues (p. 59)
cost driver (p. 54)	indirect manufacturing costs (p. 59)	service-sector companies (p. 58)
cost object (p. 49)	inventoriable costs (p. 59)	unit cost (p. 56)
cost of goods manufactured (p. 63)	manufacturing overhead costs (p. 59)	variable cost (p. 52)
cost tracing (p. 50)	manufacturing-sector companies	work-in-process inventory (p. 58)
direct costs of a cost object (p. 49)	(p. 58)	work in progress (p. 58)

ASSIGNMENT MATERIAL

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Questions

- 2-1** Define cost object and give three examples.
- 2-2** What is the main difference between direct costs and indirect costs?
- 2-3** Why do managers consider direct costs to be more accurate than indirect costs?
- 2-4** Name three factors that will affect the classification of a cost as direct or indirect.
- 2-5** Explain whether a business department can be a cost object.
- 2-6** What is a cost driver? Give one example.
- 2-7** What is the relevant range? What role does the relevant-range concept play in explaining how costs behave?

- 2-8** Why and when is it essential to calculate a unit cost?
- 2-9** Describe how manufacturing-, merchandising-, and service-sector companies differ from one another.
- 2-10** What are three different types of inventory that manufacturing companies hold?
- 2-11** Distinguish between inventoriable costs and period costs.
- 2-12** Define the following: direct material costs, direct manufacturing-labor costs, manufacturing overhead costs, prime costs, and conversion costs.
- 2-13** Why are overtime premium and idle time considered as indirect costs?
- 2-14** Define product cost. Describe three different purposes for computing product costs.
- 2-15** What are three common features of cost accounting and cost management?

Multiple-Choice Questions

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2-16 Applewhite Corporation, a manufacturing company, is analyzing its cost structure in a project to achieve some cost savings. Which of the following statements is/are correct?

- I. The cost of the direct materials in Applewhite's products is considered a variable cost.
 - II. The cost of the depreciation of Applewhite's plant machinery is considered a variable cost because Applewhite uses an accelerated depreciation method for both book and income tax purposes.
 - III. The cost of electricity for Applewhite's manufacturing facility is considered a fixed cost, even if the cost of the electricity has both variable and fixed components.
1. I, II, and III are correct.
 2. I only is correct.
 3. II and III only are correct.
 4. None of the listed choices is correct.

2-17 Comprehensive Care Nursing Home is required by statute and regulation to maintain a minimum 3 to 1 ratio of direct service staff to residents to maintain the licensure associated with the Nursing Home beds. The salary expense associated with direct service staff for the Comprehensive Care Nursing Home would most likely be classified as:

1. Variable cost.
2. Fixed cost.
3. Overhead costs.
4. Inventoriable costs.

2-18 Frisco Corporation is analyzing its fixed and variable costs within its current relevant range. As its cost driver activity changes within the relevant range, which of the following statements is/are correct?

- I. As the cost driver level increases, total fixed cost remains unchanged.
 - II. As the cost driver level increases, unit fixed cost increases.
 - III. As the cost driver level decreases, unit variable cost decreases.
1. I, II, and III are correct.
 2. I and II only are correct.
 3. I only is correct.
 4. II and III only are correct.

2-19 Year 1 financial data for the ABC Company is as follows:

Sales	\$5,000,000
Direct materials	850,000
Direct manufacturing labor	1,700,000
Variable manufacturing overhead	400,000
Fixed manufacturing overhead	750,000
Variable SG&A	150,000
Fixed SG&A	250,000

Under the absorption method, Year 1 Cost of Goods sold will be:

- | | |
|----------------|----------------|
| a. \$2,550,000 | c. \$3,100,000 |
| b. \$2,950,000 | d. \$3,700,000 |

2-20 The following information was extracted from the accounting records of Roosevelt Manufacturing Company:

Direct materials purchased	80,000
Direct materials used	76,000
Direct manufacturing labor costs	10,000
Indirect manufacturing labor costs	12,000
Sales salaries	14,000
Other plant expenses	22,000
Selling and administrative expenses	20,000

What was the cost of goods manufactured?

- | | |
|--------------|--------------|
| 1. \$124,000 | 3. \$154,000 |
| 2. \$120,000 | 4. \$170,000 |

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Exercises

2-21 Computing and interpreting manufacturing unit costs. Minnesota Office Products (MOP) produces three different paper products at its Vaasa lumber plant: Supreme, Deluxe, and Regular. Each product has its own dedicated production line at the plant. It currently uses the following three-part classification for its manufacturing costs: direct materials, direct manufacturing labor, and manufacturing overhead costs. Total manufacturing overhead costs of the plant in July 2017 are \$150 million (\$15 million of which are fixed). This total amount is allocated to each product line on the basis of the direct manufacturing labor costs of each line. Summary data (in millions) for July 2017 are as follows:

	Supreme	Deluxe	Regular
Direct material costs	\$ 89	\$ 57	\$ 60
Direct manufacturing labor costs	\$ 16	\$ 26	\$ 8
Manufacturing overhead costs	\$ 48	\$ 78	\$ 24
Units produced	125	150	140

Required

1. Compute the manufacturing cost per unit for each product produced in July 2017.
2. Suppose that, in August 2017, production was 150 million units of Supreme, 190 million units of Deluxe, and 220 million units of Regular. Why might the July 2017 information on manufacturing cost per unit be misleading when predicting total manufacturing costs in August 2017?

2-22 Direct, indirect, fixed, and variable costs. Sumitomo Cable manufactures various types of aluminum and copper cables which it sells directly to retail outlets through its distribution channels. The manufacturing process for producing cables includes a process called wire draw in which the aluminum and copper rods are pulled through a series of synthetic dies, which gradually decrease in size. The wires are then passed through an extruder, where either a single or a double coating of plastic is applied. These insulated wires are twisted into pairs by the Twisting and Stranding Department. The final shape is given to the wires by the Jacketing and Packaging department after carrying out the process of quality control.

Required

1. Costs involved in the different processes are listed below. For each cost, indicate whether it is a direct variable, direct fixed, indirect variable, or indirect fixed cost, assuming that the "units of production of each kind of wire" is the cost object.

Costs:

Aluminum and copper rods	Quality control
Insulating materials	Repairs to machines
Wages for wire draw	Normal wastages and spoilages
Depreciation on machineries	Store-keeper's salary
Depreciation on factory building	Material testing
Insurance on factory building	Materials used by jacketing and packaging department
Consumable stores and dies	Factory general utilities
Wages for machine operators	Fuel for factory generator
Power	Supervisors' salaries

2. If the cost object were the "Jacketing and Packaging department" instead, which costs from requirement 1 would now be direct instead of indirect costs?

2-23 Classification of costs, service sector. Market Focus is a marketing research firm that organizes focus groups for consumer-product companies. Each focus group has eight individuals who are paid \$60 per session to provide comments on new products. These focus groups meet in hotels and are led by a trained, independent marketing specialist hired by Market Focus. Each specialist is paid a fixed retainer to conduct a minimum number of sessions and a per session fee of \$2,200. A Market Focus staff member attends each session to ensure that all the logistical aspects run smoothly.

Classify each cost item (A–H) as follows:

- Direct or indirect (D or I) costs of each individual focus group.
- Variable or fixed (V or F) costs of how the total costs of Market Focus change as the number of focus groups conducted changes. (If in doubt, select on the basis of whether the total costs will change substantially if there is a large change in the number of groups conducted.)

You will have two answers (D or I; V or F) for each of the following items:

Required

Cost Item	D or I V or F
A. Payment to individuals in each focus group to provide comments on new products	
B. Annual subscription of Market Focus to <i>Consumer Reports</i> magazine	
C. Phone calls made by Market Focus staff member to confirm individuals will attend a focus group session (Records of individual calls are not kept.)	
D. Retainer paid to focus group leader to conduct 18 focus groups per year on new medical products	
E. Recruiting cost to hire marketing specialists	
F. Lease payment by Market Focus for corporate office	
G. Cost of tapes used to record comments made by individuals in a focus group session (These tapes are sent to the company whose products are being tested.)	
H. Gasoline costs of Market Focus staff for company-owned vehicles (Staff members submit monthly bills with no mileage breakdowns.)	
I. Costs incurred to improve the design of focus groups to make them more effective	

2-24 Classification of costs, merchandising sector. Band Box Entertainment (BBE) operates a large store in Atlanta, Georgia. The store has both a movie (DVD) section and a music (CD) section. BBE reports revenues for the movie section separately from the music section.

Classify each cost item (A–H) as follows:

- Direct or indirect (D or I) costs of the total number of DVDs sold.
- Variable or fixed (V or F) costs of how the total costs of the movie section change as the total number of DVDs sold changes. (If in doubt, select on the basis of whether the total costs will change substantially if there is a large change in the total number of DVDs sold.)

You will have two answers (D or I; V or F) for each of the following items:

Required

Cost Item	D or I V or F
A. Annual retainer paid to a video distributor	
B. Cost of store manager's salary	
C. Costs of DVDs purchased for sale to customers	
D. Subscription to <i>DVD Trends</i> magazine	
E. Leasing of computer software used for financial budgeting at the BBE store	
F. Cost of popcorn provided free to all customers of the BBE store	
G. Cost of cleaning the store every night after closing	
H. Freight-in costs of DVDs purchased by BBE	

2-25 Classification of costs, manufacturing sector. The Cooper Furniture Company of Potomac, Maryland, assembles two types of chairs (Recliners and Rockers). Separate assembly lines are used for each type of chair.

Classify each cost item (A–I) as follows:

- Direct or indirect (D or I) cost for the total number of Recliners assembled.
- Variable or fixed (V or F) cost depending on how total costs change as the total number of Recliners assembled changes. (If in doubt, select on the basis of whether the total costs will change substantially if there is a large change in the total number of Recliners assembled.)

Required

You will have two answers (D or I; V or F) for each of the following items:

Cost Item	D or I V or F
A. Cost of fabric used on Recliners	
B. Salary of public relations manager for Cooper Furniture	
C. Annual convention for furniture manufacturers; generally Cooper Furniture attends	
D. Cost of lubricant used on the Recliner assembly line	
E. Freight costs of Recliner frames shipped from Durham to Potomac, MD	
F. Electricity costs for Recliner assembly line (single bill covers entire plant)	
G. Wages paid to temporary assembly-line workers hired in periods of high Recliner production (paid on hourly basis)	
H. Annual fire-insurance policy cost for Potomac, MD plant	
I. Wages paid to plant manager who oversees the assembly lines for both chair types	

2-26 Variable costs, fixed costs, total costs. Bridget Ashton is getting ready to open a small restaurant. She is on a tight budget and must choose between the following long-distance phone plans:

Plan A: Pay 10 cents per minute of long-distance calling.

Plan B: Pay a fixed monthly fee of \$15 for up to 240 long-distance minutes and 8 cents per minute thereafter (if she uses fewer than 240 minutes in any month, she still pays \$15 for the month).

Plan C: Pay a fixed monthly fee of \$22 for up to 510 long-distance minutes and 5 cents per minute thereafter (if she uses fewer than 510 minutes, she still pays \$22 for the month).

Required

1. Draw a graph of the total monthly costs of the three plans for different levels of monthly long-distance calling.
2. Which plan should Ashton choose if she expects to make 100 minutes of long-distance calls? 240 minutes? 540 minutes?

2-27 Variable and fixed costs. Consolidated Motors specializes in producing one specialty vehicle. It is called Surfer and is styled to easily fit multiple surfboards in its back area and top-mounted storage racks.

Consolidated has the following manufacturing costs:

Plant management costs, \$1,992,000 per year

Cost of leasing equipment, \$1,932,000 per year

Workers' wages, \$800 per Surfer vehicle produced

Direct materials costs: Steel, \$1,400 per Surfer; Tires, \$150 per tire, each Surfer takes 5 tires (one spare).

City license, which is charged monthly based on the number of tires used in production:

0–500 tires	\$ 40,040
501–1,000 tires	\$ 65,000
more than 1,000 tires	\$249,870

Consolidated currently produces 170 vehicles per month.

Required

1. What is the variable manufacturing cost per vehicle? What is the fixed manufacturing cost per month?
2. Plot a graph for the variable manufacturing costs and a second for the fixed manufacturing costs per month. How does the concept of relevant range relate to your graphs? Explain.
3. What is the total manufacturing cost of each vehicle if 80 vehicles are produced each month? 205 vehicles? How do you explain the difference in the manufacturing cost per unit?

2-28 Variable costs, fixed costs, relevant range. Dotball Candies manufactures jaw-breaker candies in a fully automated process. The machine that produces candies was purchased recently and can make 4,400 per month. The machine costs \$9,500 and is depreciated using straight-line depreciation over 10 years assuming zero residual value. Rent for the factory space and warehouse and other fixed manufacturing overhead costs total \$1,300 per month.

Dotball currently makes and sells 3,100 jaw-breakers per month. Dotball buys just enough materials each month to make the jaw-breakers it needs to sell. Materials cost 10 cents per jawbreaker. Next year Dotball expects demand to increase by 100%. At this volume of materials purchased, it will get a 10% discount on price. Rent and other fixed manufacturing overhead costs will remain the same.

Required

1. What is Dotball's current annual relevant range of output?
2. What is Dotball's current annual fixed manufacturing cost within the relevant range? What is the annual variable manufacturing cost?
3. What will Dotball's relevant range of output be next year? How, if at all, will total annual fixed and variable manufacturing costs change next year? Assume that if it needs to Dotball could buy an identical machine at the same cost as the one it already has.

2-29 Cost drivers and value chain. Torrance Technology Company (TTC) is developing a new touch-screen smartphone to compete in the cellular phone industry. The company will sell the phones at whole-sale prices to cell phone companies, which will in turn sell them in retail stores to the final customer. TTC has undertaken the following activities in its value chain to bring its product to market:

- A. Perform market research on competing brands
- B. Design a prototype of the TTC smartphone
- C. Market the new design to cell phone companies
- D. Manufacture the TTC smartphone
- E. Process orders from cell phone companies
- F. Deliver the TTC smartphones to the cell phone companies
- G. Provide online assistance to cell phone users for use of the TTC smartphone
- H. Make design changes to the smartphone based on customer feedback

During the process of product development, production, marketing, distribution, and customer service, TTC has kept track of the following cost drivers:

Number of smartphones shipped by TTC
 Number of design changes
 Number of deliveries made to cell phone companies
 Engineering hours spent on initial product design
 Hours spent researching competing market brands
 Customer-service hours
 Number of smartphone orders processed
 Machine hours required to run the production equipment

1. Identify each value-chain activity listed at the beginning of the exercise with one of the following value-chain categories:
 - a. Design of products and processes
 - b. Production
 - c. Marketing
 - d. Distribution
 - e. Customer service
2. Use the list of preceding cost drivers to find one or more reasonable cost drivers for each of the activities in TTC's value chain.

Required

2-30 Cost drivers and functions. The representative cost drivers in the right column of this table are randomized so they do not match the list of functions in the left column.

Function	Representative Cost Driver
1. Inspection of materials	A. Number of batches produced
2. Accounts receivable	B. Number of sales orders
3. Employee training	C. Number of machines repaired
4. Repairs of machines	D. Number of labors supervised
5. Testing of samples	E. Number of purchase orders
6. Dispatching	F. Number of bills issued to customers
7. Supervisions	G. Number of employees trained

1. Match each function with its representative cost driver.
2. Give a second example of a cost driver for each function.

Required

2-31 Total costs and unit costs, service setting. The Big Event (TBE) recently started a business organizing food and music at weddings and other large events. In order to better understand the profitability of the business, the owner has asked you for an analysis of costs—what costs are fixed, what costs are variable, and so on, for each event. You have the following cost information:

Music costs: \$10,000 per event

Catering costs:

Food: \$65 per guest

Setup/cleanup: \$15 per guest

Fixed fee: \$4,000 per event

Required

TBE has allowed the caterer, who is also new in business, to place business cards on each table as a form of advertising. This has proved quite effective, and the caterer gives TBE a discount of \$5 per guest in exchange for allowing the caterer to advertise.

1. Draw a graph depicting fixed costs, variable costs, and total costs for each event versus the number of guests.
2. Suppose 150 persons attend the next event. What is TBE's total net cost and the cost per attendee?
3. Suppose instead that 200 persons attend. What is TBE's total net cost and the cost per attendee?
4. How should TBE charge customers for its services? Explain briefly.

2-32 Total and unit cost, decision making. Gayle's Glassworks makes glass flanges for scientific use. Materials cost \$1 per flange, and the glass blowers are paid a wage rate of \$28 per hour. A glass blower blows 10 flanges per hour. Fixed manufacturing costs for flanges are \$28,000 per period. Period (nonmanufacturing) costs associated with flanges are \$10,000 per period and are fixed.

Required

1. Graph the fixed, variable, and total manufacturing cost for flanges, using units (number of flanges) on the x-axis.
2. Assume Gayle's Glassworks manufactures and sells 5,000 flanges this period. Its competitor, Flora's Flasks, sells flanges for \$10 each. Can Gayle sell below Flora's price and still make a profit on the flanges?
3. How would your answer to requirement 2 differ if Gayle's Glassworks made and sold 10,000 flanges this period? Why? What does this indicate about the use of unit cost in decision making?

2-33 Inventoriable costs versus period costs. Each of the following cost items pertains to one of these companies: Best Buy (a merchandising-sector company), KitchenAid (a manufacturing-sector company), and HughesNet (a service-sector company):

- a. Cost of phones and computers available for sale in Best Buy's electronics department
- b. Electricity used to provide lighting for assembly-line workers at a KitchenAid manufacturing plant
- c. Depreciation on HughesNet satellite equipment used to provide its services
- d. Electricity used to provide lighting for Best Buy's store aisles
- e. Wages for personnel responsible for quality testing of the KitchenAid products during the assembly process
- f. Salaries of Best Buy's marketing personnel planning local-newspaper advertising campaigns
- g. Perrier mineral water purchased by HughesNet for consumption by its software engineers
- h. Salaries of HughesNet area sales managers
- i. Depreciation on vehicles used to transport KitchenAid products to retail stores

Required

1. Distinguish between manufacturing-, merchandising-, and service-sector companies.
2. Distinguish between inventoriable costs and period costs.
3. Classify each of the cost items (a–i) as an inventoriable cost or a period cost. Explain your answers.

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Problems

2-34 Computing cost of goods purchased and cost of goods sold. The following data are for Marvin Department Store. The account balances (in thousands) are for 2017.

Marketing, distribution, and customer-service costs	\$ 37,000
Merchandise inventory, January 1, 2017	27,000
Utilities	17,000
General and administrative costs	43,000
Merchandise inventory, December 31, 2017	34,000
Purchases	155,000
Miscellaneous costs	4,000
Transportation-in	7,000
Purchase returns and allowances	4,000
Purchase discounts	6,000
Revenues	280,000

Required

1. Compute (a) the cost of goods purchased and (b) the cost of goods sold.
2. Prepare the income statement for 2017.

2-35 Cost of goods purchased, cost of goods sold, and income statement. The following data are for Huang Wong Ping Retail Outlet Stores. The account balances (in thousands) are for 2017.

Marketing and advertising costs	\$ 54,300
Merchandise inventory, January 1, 2017	115,800
Shipping of merchandise to customers	5,700
Depreciation on store fixtures	10,420
Purchases	654,000
General and administrative costs	74,800
Merchandise inventory, December 31, 2017	124,200
Merchandise freight-in	25,000
Purchase returns and allowances	32,400
Purchase discounts	22,600
Revenues	798,000

1. Compute (a) the cost of goods purchased and (b) the cost of goods sold.
2. Prepare the income statement for 2017.

Required

2-36 Flow of Inventoriable Costs. Renka's Heaters selected data for October 2017 are presented here (in millions):

Direct materials inventory 10/1/2017	\$ 105
Direct materials purchased	365
Direct materials used	385
Total manufacturing overhead costs	450
Variable manufacturing overhead costs	265
Total manufacturing costs incurred during October 2017	1,610
Work-in-process inventory 10/1/2017	230
Cost of goods manufactured	1,660
Finished-goods inventory 10/1/2017	130
Cost of goods sold	1,770

Calculate the following costs:

1. Direct materials inventory 10/31/2017
2. Fixed manufacturing overhead costs for October 2017
3. Direct manufacturing labor costs for October 2017
4. Work-in-process inventory 10/31/2017
5. Cost of finished goods available for sale in October 2017
6. Finished goods inventory 10/31/2017

Required

2-37 Cost of goods manufactured, income statement, manufacturing company. Consider the following account balances (in thousands) for the Peterson Company:

Peterson Company	Beginning of 2017	End of 2017
Direct materials inventory	21,000	23,000
Work-in-process inventory	26,000	25,000
Finished-goods inventory	13,000	20,000
Purchases of direct materials		74,000
Direct manufacturing labor		22,000
Indirect manufacturing labor		17,000
Plant insurance		7,000
Depreciation—plant, building, and equipment		11,000
Repairs and maintenance—plant		3,000
Marketing, distribution, and customer-service costs		91,000
General and administrative costs		24,000

1. Prepare a schedule for the cost of goods manufactured for 2017.
2. Revenues for 2017 were \$310 million. Prepare the income statement for 2017.

Required

2-38 Cost of goods manufactured, income statement, manufacturing company. Consider the following account balances (in thousands) for the Carolina Corporation:

Carolina Corporation	Beginning of 2017	End of 2017
Direct materials inventory	124,000	73,000
Work-in-process inventory	173,000	145,000
Finished-goods inventory	240,000	206,000
Purchases of direct materials		262,000
Direct manufacturing labor		217,000
Indirect manufacturing labor		97,000
Plant insurance		9,000
Depreciation—plant, building, and equipment		45,000
Plant utilities		26,000
Repairs and maintenance—plant		12,000
Equipment leasing costs		65,000
Marketing, distribution, and customer-service costs		125,000
General and administrative costs		71,000

Required

1. Prepare a schedule for the cost of goods manufactured for 2017.
2. Revenues (in thousands) for 2017 were \$1,300,000. Prepare the income statement for 2017.

2-39 Income statement and schedule of cost of goods manufactured. The Howell Corporation has the following account balances (in millions):

For Specific Date		For Year 2017	
Direct materials inventory, Jan. 1, 2017	\$15	Purchases of direct materials	\$325
Work-in-process inventory, Jan. 1, 2017	10	Direct manufacturing labor	100
Finished goods inventory, Jan. 1, 2017	70	Depreciation—plant and equipment	80
Direct materials inventory, Dec. 31, 2017	20	Plant supervisory salaries	5
Work-in-process inventory, Dec. 31, 2017	5	Miscellaneous plant overhead	35
Finished goods inventory, Dec. 31, 2017	55	Revenues	950
		Marketing, distribution, and customer-service costs	240
		Plant supplies used	10
		Plant utilities	30
		Indirect manufacturing labor	60

Required

Prepare an income statement and a supporting schedule of cost of goods manufactured for the year ended December 31, 2017. (For additional questions regarding these facts, see the next problem.)

2-40 Interpretation of statements (continuation of 2-39).

Required

1. How would the answer to Problem 2-39 be modified if you were asked for a schedule of cost of goods manufactured and sold instead of a schedule of cost of goods manufactured? Be specific.
2. Would the sales manager's salary (included in marketing, distribution, and customer-service costs) be accounted for any differently if the Howell Corporation were a merchandising-sector company instead of a manufacturing-sector company?
3. Using the flow of manufacturing costs outlined in Exhibit 2-9 (page 64), describe how the wages of an assembler in the plant would be accounted for in this manufacturing company.
4. Plant supervisory salaries are usually regarded as manufacturing overhead costs. When might some of these costs be regarded as direct manufacturing costs? Give an example.
5. Suppose that both the direct materials used and the plant and equipment depreciation are related to the manufacture of 1 million units of product. What is the unit cost for the direct materials assigned to those units? What is the unit cost for plant and equipment depreciation? Assume that yearly plant and equipment depreciation is computed on a straight-line basis.
6. Assume that the implied cost-behavior patterns in requirement 5 persist. That is, direct material costs behave as a variable cost and plant and equipment depreciation behaves as a fixed cost. Repeat the computations in requirement 5, assuming that the costs are being predicted for the manufacture of 1.2 million units of product. How would the total costs be affected?
7. As a management accountant, explain concisely to the president why the unit costs differed in requirements 5 and 6.

2-41 Income statement and schedule of cost of goods manufactured. The following items (in millions) pertain to Schaeffer Corporation:

Schaeffer's manufacturing costing system uses a three-part classification of direct materials, direct manufacturing labor, and manufacturing overhead costs.

For Specific Date		For Year 2017	
Work-in-process inventory, Jan. 1, 2017	\$10	Plant utilities	\$ 8
Direct materials inventory, Dec. 31, 2017	4	Indirect manufacturing labor	21
Finished-goods inventory, Dec. 31, 2017	16	Depreciation—plant and equipment	6
Accounts payable, Dec. 31, 2017	24	Revenues	359
Accounts receivable, Jan. 1, 2017	53	Miscellaneous manufacturing overhead	15
Work-in-process inventory, Dec. 31, 2017	5	Marketing, distribution, and customer-service costs	90
Finished-goods inventory, Jan 1, 2017	46	Direct materials purchased	88
Accounts receivable, Dec. 31, 2017	32	Direct manufacturing labor	40
Accounts payable, Jan. 1, 2017	45	Plant supplies used	9
Direct materials inventory, Jan. 1, 2017	34	Property taxes on plant	2

Prepare an income statement and a supporting schedule of cost of goods manufactured. (For additional questions regarding these facts, see the next problem.)

Required

2-42 Terminology, interpretation of statements (continuation of 2-41).

1. Calculate total prime costs and total conversion costs.
2. Calculate total inventoriable costs and period costs.
3. Design costs and R&D costs are not considered product costs for financial statement purposes. When might some of these costs be regarded as product costs? Give an example.
4. Suppose that both the direct materials used and the depreciation on plant and equipment are related to the manufacture of 2 million units of product. Determine the unit cost for the direct materials assigned to those units and the unit cost for depreciation on plant and equipment. Assume that yearly depreciation is computed on a straight-line basis.
5. Assume that the implied cost-behavior patterns in requirement 4 persist. That is, direct material costs behave as a variable cost and depreciation on plant and equipment behaves as a fixed cost. Repeat the computations in requirement 4, assuming that the costs are being predicted for the manufacture of 3 million units of product. Determine the effect on total costs.
6. Assume that depreciation on the equipment (but not the plant) is computed based on the number of units produced because the equipment deteriorates with units produced. The depreciation rate on equipment is \$1.50 per unit. Calculate the depreciation on equipment assuming (a) 2 million units of product are produced and (b) 3 million units of product are produced.

Required

2-43 Labor cost, overtime, and idle time. Akua works in the manufacturing department of Impala Iron Works (IIW) as a machine operator. Akua, a long-time employee of IIW, is paid on an hourly basis at a rate of \$25 per hour. She works five 8-hour shifts per week from Monday to Friday (40 hours). Any time Akua works beyond these 40 hours is considered overtime for which she is paid at a rate of 160% (\$40 per hour). If the overtime falls on weekends, Akua is paid at a rate of double time (\$50 per hour). She is also paid an additional \$26 per hour for working on any holidays worked, even if it is part of her regular 40 hours. Akua is paid her regular wages even if the machines are down (not operating) due to regular machine maintenance, slow order periods, or unexpected mechanical problems. These hours are considered "idle time."

During December Akua worked the following hours:

	Hours worked including machine downtime	Machine downtime
Week 1	49	5.0
Week 2	51	6.0
Week 3	45	3.0
Week 4	47	4.0

Included in the total hours worked are two company holidays (Christmas Eve and Christmas Day) during Week 4. All overtime worked by Akua was Monday–Friday, except for the hours worked in Week 3; all of the Week 3 overtime hours were worked on a Saturday.

Required

1. Calculate (a) direct manufacturing labor, (b) idle time, (c) overtime and holiday premium, and (d) total earnings for Akua in December.
2. Is idle time and overtime premium a direct or indirect cost of the products that Akua worked on in December? Explain.

2-44 Missing records, computing inventory costs. Ron Howard recently took over as the controller of Johnson Brothers Manufacturing. Last month, the previous controller left the company with little notice and left the accounting records in disarray. Ron needs the ending inventory balances to report first-quarter numbers.

For the previous month (March 2017) Ron was able to piece together the following information:

Direct materials purchased	\$120,000
Work-in-process inventory, 3/1/2017	\$ 35,000
Direct materials inventory, 3/1/2017	\$ 12,500
Finished-goods inventory, 3/1/2017	\$160,000
Conversion costs	\$330,000
Total manufacturing costs added during the period	\$420,000
Cost of goods manufactured	4 times direct materials used
Gross margin as a percentage of revenues	20%
Revenues	\$518,750

Calculate the cost of:

Required

1. Finished-goods inventory, 3/31/2017
2. Work-in-process inventory, 3/31/2017
3. Direct materials inventory, 3/31/2017

2-45 Comprehensive problem on unit costs, product costs. Atlanta Office Equipment manufactures and sells metal shelving. It began operations on January 1, 2017. Costs incurred for 2017 are as follows (V stands for variable; F stands for fixed):

Direct materials used	\$149,500 V
Direct manufacturing labor costs	34,500 V
Plant energy costs	6,000 V
Indirect manufacturing labor costs	12,000 V
Indirect manufacturing labor costs	17,000 F
Other indirect manufacturing costs	7,000 V
Other indirect manufacturing costs	27,000 F
Marketing, distribution, and customer-service costs	126,000 V
Marketing, distribution, and customer-service costs	47,000 F
Administrative costs	58,000 F

Variable manufacturing costs are variable with respect to units produced. Variable marketing, distribution, and customer-service costs are variable with respect to units sold.

Inventory data are as follows:

	Beginning: January 1, 2017	Ending: December 31, 2017
Direct materials	0 lb	2,300 lbs
Work in process	0 units	0 units
Finished goods	0 units	? units

Production in 2017 was 115,000 units. Two pounds of direct materials are used to make one unit of finished product.

Revenues in 2017 were \$540,000. The selling price per unit and the purchase price per pound of direct materials were stable throughout the year. The company's ending inventory of finished goods is carried at the average unit manufacturing cost for 2017. Finished-goods inventory at December 31, 2017, was \$15,400.

Required

1. Calculate direct materials inventory, total cost, December 31, 2017.
2. Calculate finished-goods inventory, total units, December 31, 2017.
3. Calculate selling price in 2017.
4. Calculate operating income for 2017.

2-46 Different meanings of product costs. There are at least 3 different purposes for which we measure product costs. They are (1) pricing and product mix decisions, (2) determining the appropriate charge for a government contract, and (3) for preparing financial statements for external reporting following Generally Accepted Accounting Principles. On the following table, indicate whether the indicated cost would be included or excluded for the particular purpose. If your answer is not definitive (include or exclude), provide a short explanation of why.

Type of Cost	Purpose: Pricing/ Product Mix	Purpose: Government Contract	Purpose: Financial Statement (using GAAP)
Direct Material			
Direct Manufacturing Labor			
Manufacturing Overhead			
Marketing Costs			
Distribution Expense			
Customer Service			

2-47 Cost classification; ethics. Adalard Müller, the new plant manager of New Times Manufacturing Plant Number 12, has just reviewed a draft of his year-end financial statements. Müller receives a year-end bonus of 8% of the plant's operating income before tax. The year-end income statement provided by the plant's controller was disappointing to say the least. After reviewing the numbers, Müller demanded that his controller go back and "work the numbers" again. Müller insisted that if he didn't see a better operating income number the next time around he would be forced to look for a new controller.

New Times Manufacturing classifies all costs directly related to the manufacturing of its product as product costs. These costs are inventoried and later expensed as costs of goods sold when the product is sold. All other expenses, including finished goods warehousing costs of \$3,570,000, are classified as period expenses. Müller had suggested that warehousing costs be included as product costs because they are "definitely related to our product." The company produced 210,000 units during the period and sold 190,000 units.

As the controller reworked the numbers, he discovered that if he included warehousing costs as product costs, he could improve operating income by \$340,000. He was also sure these new numbers would make Müller happy.

1. Show numerically how operating income would improve by \$340,000 just by classifying the preceding costs as product costs instead of period expenses.
2. Is Müller correct in his justification that these costs are "definitely related to our product"?
3. By how much will Müller profit personally if the controller makes the adjustments in requirement 1?
4. What should the plant controller do?

Required

2-48 Finding unknown amounts. An auditor for the Internal Revenue Service is trying to reconstruct some partially destroyed records of two taxpayers. For each case in the accompanying list, find the unknown elements designated by the letters A and B for Case 1 and C and D for Case 2.

	Case 1	Case 2
	(in thousands)	
Accounts receivable, 12/31	\$ 10,250	\$ 4,500
Cost of goods sold	A	33,400
Accounts payable, 1/1	5,900	2,850
Accounts payable, 12/31	2,700	2,250
Finished goods inventory, 12/31	B	6,300
Gross margin	26,000	C
Work-in-process inventory, 1/1	4,600	2,800
Work-in-process inventory, 12/31	2,300	5,500
Finished goods inventory, 1/1	6,600	5,100
Direct materials used	14,500	20,200
Direct manufacturing labor costs	5,200	7,300
Manufacturing overhead costs	10,400	D
Purchases of direct materials	13,500	10,500
Revenues	64,500	57,600
Accounts receivable, 1/1	6,400	3,200

3

Cost–Volume–Profit Analysis

LEARNING OBJECTIVES

- 1 Explain the features of cost–volume–profit (CVP) analysis
- 2 Determine the breakeven point and output level needed to achieve a target operating income
- 3 Understand how income taxes affect CVP analysis
- 4 Explain how managers use CVP analysis to make decisions
- 5 Explain how sensitivity analysis helps managers cope with uncertainty
- 6 Use CVP analysis to plan variable and fixed costs
- 7 Apply CVP analysis to a company producing multiple products
- 8 Apply CVP analysis in service and not-for-profit organizations
- 9 Distinguish contribution margin from gross margin

All managers want to know how profits will change as the units sold, selling price, or the cost per unit of a product or service change.

Home Depot managers, for example, might wonder how many units of a new power drill must be sold to break even or make a certain amount of profit. Procter & Gamble managers might ask themselves how expanding their business in Nigeria would affect costs, revenues, and profits. These questions have a common “what-if” theme: What if we sold more power drills? What if we started selling in Nigeria? Examining the results of these what-if possibilities and alternatives helps managers make better decisions.

The following article explains how Goldenvoice, the organizer of the Coachella music festival in California, generated additional revenues to cover its fixed costs and turn a loss into a profit.

HOW COACHELLA TUNES UP THE SWEET SOUND OF PROFITS¹

Each year, the Coachella music festival in California features more than 150 of the biggest names in rock, hip-hop, and electronic dance music. Putting on this annual music extravaganza is a costly endeavor. Headlining acts such as Drake and Jack White command as much as \$4 million to perform, and production—including stagehands, insurance, and security—costs up to \$12 million before the first note is played.

To cover its high fixed costs and make a profit, Coachella needs to sell a lot of tickets. After struggling for years to turn a profit, Goldenvoice expanded Coachella to two identical editions taking place on consecutive weekends. Same venue, same lineup, and same ticket price. Goldenvoice also launched Stagecoach, a country music festival that occupies the same California venue one week after Coachella. This allowed temporary infrastructure costs such as stages and fencings to be shared across both events. With tickets prices from \$375 to \$889, the 2015 Coachella festival sold a staggering \$84 million in tickets,



WENN Ltd/Alamy Stock Photo

¹ Sources: Chris Parker, “The Economics of Music Festivals: Who’s Getting Rich? Who’s Going Broke?” *L.A. Weekly*, April 17, 2013 (<http://www.laweekly.com/music/the-economics-of-music-festivals-whos-getting-rich-whos-going-broke-4167927>); Anil Patel, “Coachella: A Lesson in Strategic Growth,” *Anil Patel’s blog*, LinkedIn, April 17, 2015 (<https://www.linkedin.com/pulse/coachella-lesson-strategic-growth-anil-patel>); Ray Waddell, “Coachella Earns Over \$84 Million, Breaks Attendance Records,” *Billboard*, July 15, 2015 (<http://www.billboard.com/articles/business/6633636/coachella-2015-earnings-84-million-breaks-attendance-records>).

while the follow-on Stagecoach festival grossed more than \$21 million in ticket sales. By expanding Coachella's volume, Goldenvoice was able to recover its fixed costs and tune up the sweet sound of profits.

Businesses that have high fixed costs, such as American Airlines and General Motors, have to pay particular attention to the "what-ifs" behind decisions because these companies need significant revenues just to break even. In the airline industry, for example, the profits most airlines make come from the last two to five passengers who board each flight! Consequently, when revenues at American Airlines dropped, it was forced to declare bankruptcy. In this chapter, you will see how cost-volume-profit (CVP) analysis helps managers minimize such risks.

Essentials of CVP Analysis

In Chapter 2, we discussed total revenues, total costs, and income. Managers use **cost-volume-profit (CVP) analysis** to study the behavior of and relationship among these elements as changes occur in the number of units sold, the selling price, the variable cost per unit, or the fixed costs of a product. Consider this example:

Example: Emma Jones is a young entrepreneur who recently used *GMAT Success*, a test-prep book and software package for the business school admission test. Emma loved the book and program so much that after graduating she signed a contract with *GMAT Success*'s publisher to sell the learning materials. She recently sold them at a college fair in Boston and is now thinking of selling them at a college fair in Chicago. Emma can purchase each package (book and software) from the publisher for \$120 per package, with the privilege of returning all unsold packages and receiving a full \$120 refund per package. She must pay \$2,000 to rent a booth at the fair. She will incur no other costs. Should she rent the booth or not?

Emma, like most managers who face such a situation, works through the series of steps introduced in Chapter 1 to make the most profitable decisions.

1. **Identify the problem and uncertainties.** Every managerial decision involves selecting a course of action. The decision to rent the booth hinges on how Emma resolves two important uncertainties: the price she can charge and the number of packages she can sell at that price. Emma must decide knowing that the outcome of the action she chooses is uncertain. The more confident she is about selling a large number of packages at a high price, the more willing she will be to rent the booth.
2. **Obtain information.** When faced with uncertainty, managers obtain information that might help them understand the uncertainties more clearly. For example, Emma gathers information about the type of individuals likely to attend the fair and other test-prep packages that might be sold at the fair. She also gathers data from her experience selling packages at the Boston fair.
3. **Make predictions about the future.** Managers make predictions using all the information available to them. Emma predicts she can charge \$200 for the *GMAT Success* package. At that price, she is reasonably confident that she will be able to sell at least 30 packages and possibly as many as 60. Emma must be realistic and exercise judgment when making these predictions. If they are too optimistic, she will rent the booth when she should not. If they are too pessimistic, she will not rent the booth when she should.

Emma's predictions rest on the belief that her experience at the Chicago fair will be similar to her experience at the Boston fair 4 months earlier. Yet Emma is uncertain about several aspects of her prediction. Are the fairs truly comparable? For example, will attendance at the two fairs be the same? Have market conditions changed over the past

LEARNING OBJECTIVE

1

Explain the features of cost-volume-profit (CVP) analysis

...how operating income changes with changes in output level, selling prices, variable costs, or fixed costs

4 months? Are there any biases creeping into her thinking? She is keen on selling at the Chicago fair because sales in the last couple of months have been lower than expected. Is this experience making her predictions overly optimistic? Has she ignored some of the competitive risks? Will the other test-prep vendors at the fair reduce their prices? If they do, should she? How many packages can she expect to sell if she does?

Emma rethinks her plan and retests her assumptions. She obtains data about student attendance and total sales in past years from the organizers of the fair. In the end, she feels quite confident that her predictions are reasonable, accurate, and carefully thought through.

4. **Make decisions by choosing among alternatives.** Emma uses the CVP analysis that follows and decides to rent the booth at the Chicago fair.
5. **Implement the decision, evaluate performance, and learn.** Thoughtful managers never stop learning. They compare their actual performance to predicted performance to understand why things worked out the way they did and what they might learn. At the end of the Chicago fair, for example, Emma would want to evaluate whether her predictions about price and the number of packages she could sell were correct. This will help her make better decisions about renting booths at future fairs.

How does Emma use CVP analysis in Step 4 to make her decision? She begins by identifying which costs are fixed and which costs are variable and then calculates *contribution margin*.

Contribution Margin

The booth-rental cost of \$2,000 is a fixed cost because it will not change no matter how many packages Emma sells. The cost of the packages is a variable cost because it increases in proportion to the number of packages sold and she can return whatever she doesn't sell for a full refund.

To understand how her operating income will change by selling different quantities of packages, Emma calculates operating income if sales are 5 packages and if sales are 40 packages.

	5 packages sold	40 packages sold
Revenues	\$ 1,000 (\$200 per package × 5 packages)	\$8,000 (\$ 200 per package × 40 packages)
Variable		
purchase costs	600 (\$120 per package × 5 packages)	4,800 (\$120 per package × 40 packages)
Fixed costs	2,000	2,000
Operating income	<u>\$1,600</u>	<u>\$1,200</u>

The only numbers that change from selling different quantities of packages are *total revenues* and *total variable costs*. The difference between total revenues and total variable costs is called **contribution margin**. That is,

$$\text{Contribution margin} = \text{Total revenues} - \text{Total variable costs}$$

Contribution margin indicates why operating income changes as the number of units sold changes. The contribution margin when Emma sells 5 packages is \$400 (\$1,000 in total revenues minus \$600 in total variable costs); the contribution margin when Emma sells 40 packages is \$3,200 (\$8,000 in total revenues minus \$4,800 in total variable costs). When calculating the contribution margin, be sure to subtract all variable costs. For example, if Emma incurred some variable selling costs because she paid a commission to salespeople for each package they sold at the fair, variable costs would include the cost of each package plus the sales commission paid on it.

Contribution margin per unit is a useful tool for calculating contribution margin and operating income. It is defined as:

$$\text{Contribution margin per unit} = \text{Selling price} - \text{Variable cost per unit}$$

In the *GMAT Success* example, the contribution margin per package, or per unit, is $\$200 - \$120 = \$80$. Contribution margin per unit recognizes the tight coupling of selling price and variable cost per unit. Unlike fixed costs, Emma will only incur the variable cost per unit of \$120 when she sells a unit of *GMAT Success*.

Contribution margin per unit provides a second way to calculate contribution margin:

$$\text{Contribution margin} = \text{Contribution margin per unit} \times \text{Number of units sold}$$

For example, when Emma sells 40 packages, contribution margin = \$80 per unit $\times$ 40 units = \$3,200.

Even before she gets to the fair, Emma incurs \$2,000 in fixed costs. Because the contribution margin per unit is \$80, Emma will recover \$80 for each package that she sells at the fair. Emma hopes to sell enough packages to fully recover the \$2,000 she spent renting the booth and to then make a profit.

To get a feel for how operating income will change for different quantities of packages sold, Emma can prepare a contribution income statement as in Exhibit 3-1. The income statement in Exhibit 3-1 is called a **contribution income statement** because it groups costs into variable costs and fixed costs to highlight contribution margin.

$$\text{Operating income} = \text{Contribution margin} - \text{Fixed costs}$$

Each additional package sold from 0 to 1 to 5 increases contribution margin by \$80 per package and helps Emma recover more and more of her fixed costs and reduce her operating loss. If Emma sells 25 packages, contribution margin equals \$2,000 (\$80 per package $\times$ 25 packages). This quantity exactly recovers her fixed costs and results in \$0 operating income. If Emma sells 40 packages, contribution margin increases by another \$1,200 (\$3,200 $-$ \$2,000), all of which becomes operating income. As you look across Exhibit 3-1 from left to right, you see that the increase in contribution margin exactly equals the increase in operating income (or the decrease in operating loss).

When companies, such as Samsung and Prada, sell multiple products, calculating contribution margin per unit is cumbersome. Instead of expressing contribution margin in dollars per unit, these companies express it as a percentage called **contribution margin percentage** (or **contribution margin ratio**):

$$\text{Contribution margin percentage (or contribution margin ratio)} = \frac{\text{Contribution margin}}{\text{Revenues}}$$

Consider a sales level such as the 40 units sold in Exhibit 3-1:

$$\text{Contribution margin percentage} = \frac{\$3,200}{\$8,000} = 0.40, \text{ or } 40\%$$

Contribution margin percentage is the contribution margin per dollar of revenue. Emma earns 40% for each dollar of revenue (40 cents) she takes in. Contribution margin percentage is a handy way to calculate contribution margin for different dollar amounts of revenue. Rearranging terms in the equation defining contribution margin percentage, we get:

$$\text{Contribution margin} = \text{Contribution margin percentage} \times \text{Revenues (in dollars)}$$

	Home	Insert	Page Layout	Formulas	Data	Review	View	
	A	B	C	D	E	F	G	H
1				Number of Packages Sold				
2				0	1	5	25	40
3	Revenues	\$ 200	per package	\$ 0	\$ 200	\$ 1,000	\$5,000	\$8,000
4	Variable costs	\$ 120	per package	0	120	600	3,000	4,800
5	Contribution margin	\$ 80	per package	0	80	400	2,000	3,200
6	Fixed costs	\$2,000		2,000	2,000	2,000	2,000	2,000
7	Operating income			\$(2,000)	\$(1,920)	\$(1,600)	\$ 0	\$1,200

EXHIBIT 3-1

Contribution Income Statement for Different Quantities of *GMAT Success* Packages Sold

To derive the relationship between operating income and contribution margin percentage, recall that:

$$\text{Operating income} = \text{Contribution margin} - \text{Fixed costs}$$

Substituting for contribution margin in the above equation:

$$\text{Operating income} = \text{Contribution margin percentage} \times \text{Revenues} - \text{Fixed costs}$$

For example, in Exhibit 3-1, if Emma sells 40 packages:

Revenues	\$8,000
Contribution margin percentage	40%
Contribution margin, $40\% \times \$8,000$	\$3,200
Fixed costs	<u>2,000</u>
Operating income	<u>\$1,200</u>

When there is only one product, as in our example, we can divide both the numerator and denominator of the contribution margin percentage equation by the quantity of units sold and calculate contribution margin percentage as follows:

$$\begin{aligned} \text{Contribution margin percentage} &= \frac{\text{Contribution margin} / \text{Quantity of units sold}}{\text{Revenues} / \text{Quantity of units sold}} \\ &= \frac{\text{Contribution margin per unit}}{\text{Selling price}} \end{aligned}$$

In our example,

$$\text{Contribution margin percentage} = \frac{\$80}{\$200} = 0.40, \text{ or } 40\%$$

Contribution margin percentage is a useful tool for calculating how a change in revenues changes contribution margin. As Emma's revenues increase by \$3,000 from \$5,000 to \$8,000, her contribution margin increases from \$2,000 to \$3,200 (by \$1,200):

Contribution margin at revenue of \$8,000, $0.40 \times \$8,000$	\$3,200
Contribution margin at revenue of \$5,000, $0.40 \times \$5,000$	<u>2,000</u>
Change in contribution margin when revenue increases by \$3,000, $0.40 \times \$3,000$	<u>\$1,200</u>

$$\text{Change in contribution margin} = \text{Contribution margin percentage} \times \text{Change in revenues}$$

Contribution margin analysis is a widely used technique. For example, managers at Home Depot use contribution margin analysis to evaluate how sales fluctuations during a recession will affect the company's profitability.

Expressing CVP Relationships

How was the Excel spreadsheet in Exhibit 3-1 constructed? Underlying the exhibit are some equations that express the CVP relationships. To make good decisions using CVP analysis, we must understand these relationships and the structure of the contribution income statement in Exhibit 3-1. There are three related ways (we will call them "methods") to think more deeply about and model CVP relationships:

1. The equation method
2. The contribution margin method
3. The graph method

As you will learn later in the chapter, different methods are useful for different decisions.

The equation method and the contribution margin method are most useful when managers want to determine operating income at a few specific sales levels (for example, 5, 15, 25, and 40 units sold). The graph method helps managers visualize the relationship between units sold and operating income over a wide range of quantities.

Equation Method

Each column in Exhibit 3-1 is expressed as an equation.

$$\text{Revenues} - \text{Variable costs} - \text{Fixed costs} = \text{Operating income}$$

How are revenues in each column calculated?

$$\text{Revenues} = \text{Selling price (SP)} \times \text{Quantity of units sold (Q)}$$

How are variable costs in each column calculated?

$$\text{Variable costs} = \text{Variable cost per unit (VCU)} \times \text{Quantity of units sold (Q)}$$

So,

$$\left[\left(\text{Selling price} \right) \times \left(\text{Quantity of units sold} \right) - \left(\text{Variable cost per unit} \right) \times \left(\text{Quantity of units sold} \right) \right] - \text{Fixed costs} = \text{Operating income} \quad (\text{Equation 1})$$

Equation 1 becomes the basis for calculating operating income for different quantities of units sold. For example, if you go to cell F7 in Exhibit 3-1, the calculation of operating income when Emma sells 5 packages is

$$(\$200 \times 5) - (\$120 \times 5) - \$2,000 = \$1,000 - \$600 - \$2,000 = -\$1,600$$

Contribution Margin Method

Rearranging equation 1,

$$\left[\left(\text{Selling price} - \text{Variable cost per unit} \right) \times \left(\text{Quantity of units sold} \right) \right] - \text{Fixed costs} = \text{Operating income}$$

$$\left(\text{Contribution margin per unit} \times \text{Quantity of units sold} \right) - \text{Fixed costs} = \text{Operating income} \quad (\text{Equation 2})$$

In our *GMAT Success* example, contribution margin per unit is \$80 (\$200 - \$120), so when Emma sells 5 packages,

$$\text{Operating income} = (\$80 \times 5) - \$2,000 = -\$1,600$$

Equation 2 expresses the basic idea we described earlier—each unit sold helps Emma recover \$80 (in contribution margin) of the \$2,000 in fixed costs.

Bernard Windows is a small company that installs windows. Its cost structure is as follows:

Selling price from each window installation	\$ 500
Variable cost of each window installation	\$ 400
Annual fixed costs	\$150,000

Use (a) the equation method and (b) the contribution method to calculate operating income if Bernard installs 2,000 windows.

3-1 TRY IT!

Graph Method

The graph method helps managers visualize the relationships between total revenues and total costs. The graph shows each relationship as a line. Exhibit 3-2 illustrates the graph method for selling *GMAT Success*. Because we have assumed that total costs and total revenues behave in a linear way, we need only two points to plot the line representing each of them.

1. **Total costs line.** The total costs line is the sum of fixed costs and variable costs. Fixed costs are \$2,000 for all quantities of units sold within the relevant range. To plot the total costs line, use as one point the \$2,000 fixed costs at zero units sold (point A) because variable costs are \$0 when no units are sold. Select a second point by choosing any other output level (say, 40 units sold) and determine the corresponding total costs. Total variable costs at this output level are \$4,800 (40 units $\times$ \$120 per unit). Remember, fixed costs are \$2,000 at all quantities of units sold within the relevant range, so total costs at 40 units sold equal \$6,800 (\$2,000 + \$4,800), which is point B in Exhibit 3-2. The total costs line is the straight line from point A through point B.
2. **Total revenues line.** One convenient starting point is \$0 revenues at 0 units sold, which is point C in Exhibit 3-2. Select a second point by choosing any other convenient output level and determining the corresponding total revenues. At 40 units sold, total revenues are \$8,000 (\$200 per unit $\times$ 40 units), which is point D in Exhibit 3-2. The total revenues line is the straight line from point C through point D.

The profit or loss at any sales level can be determined by the vertical distance between the two lines at that level in Exhibit 3-2. For quantities fewer than 25 units sold, total costs exceed total revenues, and the purple area indicates operating losses. For quantities greater than 25 units sold, total revenues exceed total costs, and the blue-green area indicates operating incomes. At 25 units sold, total revenues equal total costs. Emma will break even by selling 25 packages.

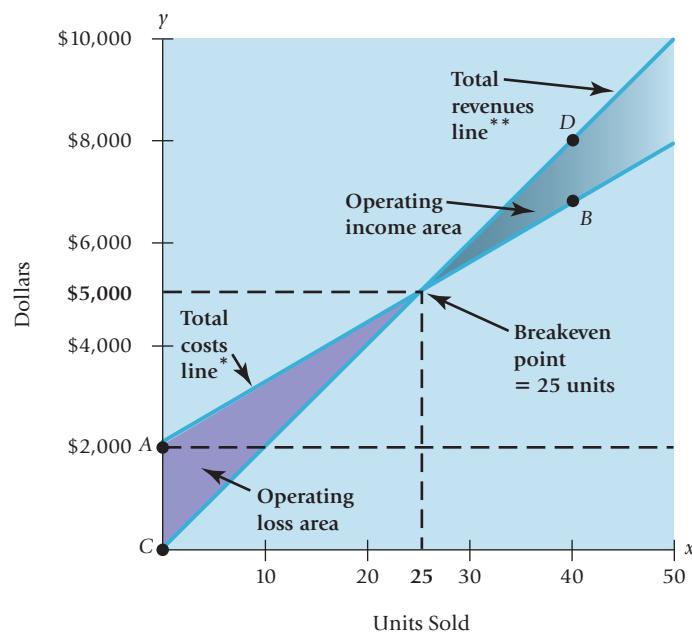
Like Emma, many companies, particularly small- and medium-sized companies, use the graph method to see how their revenues and costs will change as the quantity of units sold changes. The graph helps them understand their regions of profitability and unprofitability.

DECISION POINT

How can CVP analysis help managers?

EXHIBIT 3-2

Cost-Volume Graph for *GMAT Success*



* Slope of the total costs line is the variable cost per unit = \$120

** Slope of the total revenues line is the selling price = \$200

Cost-Volume-Profit Assumptions

Now that you know how CVP analysis works, think about the following assumptions we made during the analysis:

1. Changes in revenues and costs arise only because of changes in the number of product (or service) units sold. The number of units sold is the only revenue driver and the only cost driver. Just as a cost driver is any factor that affects costs, a **revenue driver** is a variable, such as volume, that causally affects revenues.
2. Total costs can be separated into two components: a fixed component that does not vary with units sold (such as Emma's \$2,000 booth fee) and a variable component that changes based on units sold (such as the \$120 cost per *GMAT Success* package).
3. When represented graphically, the behaviors of total revenues and total costs are linear (meaning they can be represented as a straight line) in relation to units sold within a relevant range (and time period).
4. Selling price, variable cost per unit, and total fixed costs (within a relevant range and time period) are known and constant.

As you can tell from these assumptions, to conduct a CVP analysis, you need to correctly distinguish fixed from variable costs. Always keep in mind, however, that whether a cost is variable or fixed depends on the time period for a decision.

The shorter the time horizon, the higher the percentage of total costs considered fixed. For example, suppose an American Airlines plane will depart from its gate in the next hour and currently has 20 seats unsold. A potential passenger arrives with a transferable ticket from a competing airline. American's variable costs of placing one more passenger in an otherwise empty seat (such as the cost of providing the passenger with a free beverage) is negligible. With only an hour to go before the flight departs, virtually all costs (such as crew costs and baggage-handling costs) are fixed.

Alternatively, suppose American Airlines must decide whether to continue to offer this particular flight next year. If American Airlines decides to cancel this flight because very few passengers during the last year have taken it, many more of its costs, including crew costs, baggage-handling costs, and airport fees for the flight, would be considered variable: Over this longer 1-year time period, American Airlines would not have to incur these costs if the flight were no longer operating. Always consider the relevant range, the length of the time horizon, and the specific decision situation when classifying costs as variable or fixed.

Breakeven Point and Target Operating Income

In previous sections, we used the number of packages sold as an input to the contribution income statement, the equation method, the contribution margin method, and the graph method to calculate Emma's operating income for different quantities of packages sold. In this section we use the same tools to reverse the logic. We use as input the amount of operating income Emma wants to earn and then compute the number of packages Emma must sell to earn this income. A very important question is how much Emma must sell to avoid a loss.

Breakeven Point

The **breakeven point (BEP)** is that quantity of output sold at which total revenues equal total costs—that is, the quantity of output sold that results in \$0 of operating income. You have already learned how to use the graph method to calculate the breakeven point. Recall from Exhibit 3-1 that operating income was \$0 when Emma sold 25 units; this is the breakeven point. But by understanding the equations underlying the calculations in Exhibit 3-1, we can calculate the breakeven point directly for selling *GMAT Success* rather than trying out different quantities and checking when operating income equals \$0.

LEARNING OBJECTIVE 2

Determine the breakeven point and output level needed to achieve a target operating income

... compare contribution margin and fixed costs

Recall the equation method (equation 1):

$$\left[\left(\text{Selling price} \times \text{Quantity of units sold} \right) - \left(\text{Variable cost per unit} \times \text{Quantity of units sold} \right) \right] - \text{Fixed costs} = \text{Operating income}$$

Setting operating income equal to \$0 and denoting quantity of output units that must be sold by Q ,

$$\begin{aligned} (\$200 \times Q) - (\$120 \times Q) - \$2,000 &= \$0 \\ \$80 \times Q &= \$2,000 \\ Q &= \$2,000 \div \$80 \text{ per unit} = 25 \text{ units} \end{aligned}$$

If Emma sells fewer than 25 units, she will incur a loss; if she sells 25 units, she will break even; and if she sells more than 25 units, she will make a profit. Although this breakeven point is expressed in units, it can also be expressed in revenues: 25 units $\times$ \$200 selling price = \$5,000. Recall the contribution margin method (equation 2):

$$\left(\text{Contribution margin per unit} \times \text{Quantity of units sold} \right) - \text{Fixed costs} = \text{Operating income}$$

At the breakeven point, operating income is by definition \$0, and so,

$$\text{Contribution margin per unit} \times \text{Breakeven quantity of units} = \text{Fixed costs} \quad (\text{Equation 3})$$

Rearranging equation 3 and entering the data,

$$\begin{aligned} \text{Breakeven number of units} &= \frac{\text{Fixed costs}}{\text{Contribution margin per unit}} = \frac{\$2,000}{\$80 \text{ per unit}} = 25 \text{ units} \\ \text{Breakeven revenues} &= \text{Breakeven number of units} \times \text{Selling price} \\ &= 25 \text{ units} \times \$200 \text{ per unit} = \$5,000 \end{aligned}$$

In practice (because companies have multiple products), management accountants usually calculate the breakeven point directly in terms of revenues using contribution margin percentages. Recall that in the *GMAT Success* example, at revenues of \$8,000, contribution margin is \$3,200:

$$\text{Contribution margin percentage} = \frac{\text{Contribution margin}}{\text{Revenues}} = \frac{\$3,200}{\$8,000} = 0.40, \text{ or } 40\%$$

That is, 40% of each dollar of revenue, or 40 cents, is the contribution margin. To break even, contribution margin must equal Emma's fixed costs, which are \$2,000. To earn \$2,000 of contribution margin, when \$1 of revenue results in a \$0.40 contribution margin, revenues must equal $\$2,000 \div 0.40 = \$5,000$.

$$\text{Breakeven revenues} = \frac{\text{Fixed costs}}{\text{Contribution margin \%}} = \frac{\$2,000}{0.40} = \$5,000$$

While the breakeven point tells managers how much they must sell to avoid a loss, managers are equally interested in how they will achieve the operating income targets underlying their strategies and plans. In our example, selling 25 units at a price of \$200 (equal to revenue of \$5,000) assures Emma that she will not lose money if she rents the booth. While this news is comforting, how does Emma determine how much she needs to sell to achieve a targeted amount of operating income?

Target Operating Income

Suppose Emma wants to earn an operating income of \$1,200? How many units must she sell? One approach is to keep plugging in different quantities into Exhibit 3-1 and check when

operating income equals \$1,200. Exhibit 3-1 shows that operating income is \$1,200 when 40 packages are sold. A more convenient approach is to use equation 1 from page 91.

$$\left[\left(\text{Selling price} \right) \times \left(\text{Quantity of units sold} \right) - \left(\text{Variable cost per unit} \right) \times \left(\text{Quantity of units sold} \right) \right] - \text{Fixed costs} = \text{Operating income} \quad (\text{Equation 1})$$

We denote by Q the unknown quantity of units Emma must sell to earn an operating income of \$1,200. Selling price is \$200, variable cost per package is \$120, fixed costs are \$2,000, and target operating income is \$1,200. Substituting these values into equation 1, we have

$$\begin{aligned} (\$200 \times Q) - (\$120 \times Q) - \$2,000 &= \$1,200 \\ \$80 \times Q &= \$2,000 + \$1,200 = \$3,200 \\ Q &= \$3,200 \div \$80 \text{ per unit} = 40 \text{ units} \end{aligned}$$

Alternatively, we could use equation 2,

$$\left(\text{Contribution margin per unit} \times \text{Quantity of units sold} \right) - \text{Fixed costs} = \text{Operating income} \quad (\text{Equation 2})$$

Given a target operating income (\$1,200 in this case), we can rearrange terms to get equation 4.

$$\text{Quantity of units required to be sold} = \frac{\text{Fixed costs} + \text{Target operating income}}{\text{Contribution margin per unit}} \quad (\text{Equation 4})$$

$$\text{Quantity of units required to be sold} = \frac{\$2,000 + \$1,200}{\$80 \text{ per unit}} = 40 \text{ units}$$

Proof:	Revenues, \$200 per unit $\times$ 40 units	\$8,000
	Variable costs, \$120 per unit $\times$ 40 units	4,800
	Contribution margin, \$80 per unit $\times$ 40 units	3,200
	Fixed costs	2,000
	Operating income	<u>\$1,200</u>

The revenues needed to earn an operating income of \$1,200 can also be calculated directly by recognizing (1) that \$3,200 of contribution margin must be earned (to cover the fixed costs of \$2,000 plus earn an operating income of \$1,200) and (2) that \$1 of revenue earns \$0.40 (40 cents) of contribution margin (the contribution margin percentage is 40%). To earn a contribution margin of \$3,200, revenues must equal $\$3,200 \div 0.40 = \$8,000$. That is,

$$\text{Revenues needed to earn target operating income} = \frac{\text{Fixed costs} + \text{Target operating income}}{\text{Contribution margin percentage}}$$

$$\text{Revenues needed to earn operating income of } \$1,200 = \frac{\$2,000 + \$1,200}{0.40} = \frac{\$3,200}{0.40} = \$8,000$$

Bernard Windows is a small company that installs windows. Its cost structure is as follows:

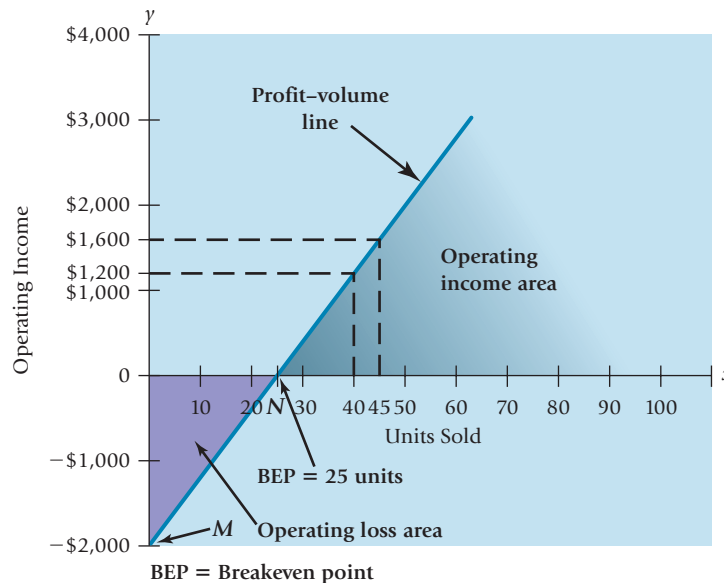
Selling price from each window installation	\$ 500
Variable cost of each window installation	\$ 400
Annual fixed costs	\$150,000

Calculate (a) the breakeven point in units and revenues and (b) the number of windows Bernard Windows must install and the revenues needed to earn a target operating income of \$100,000.

3-2 TRY IT!

EXHIBIT 3-3

Profit-Volume Graph for
GMAT Success



Could we use the graph method and the graph in Exhibit 3-2 to figure out how many units Emma must sell to earn an operating income of \$1,200? Yes, but it is not as easy to determine the precise point at which the difference between the total revenues line and the total costs line equals \$1,200. Recasting Exhibit 3-2 in the form of a profit-volume (PV) graph, however, makes it easier to answer this question.

DECISION POINT

How can managers determine the breakeven point or the output needed to achieve a target operating income?

A **PV graph** shows how changes in the quantity of units sold affect operating income. Exhibit 3-3 is the PV graph for *GMAT Success* (fixed costs, \$2,000; selling price, \$200; and variable cost per unit, \$120). The PV line can be drawn using two points. One convenient point (M) is the operating loss at 0 units sold, which is equal to the fixed costs of \$2,000 and is shown at -\$2,000 on the vertical axis. A second convenient point (N) is the breakeven point, which is 25 units in our example (see page 94). The PV line is the straight line from point M through point N. To find the number of units Emma must sell to earn an operating income of \$1,200, draw a horizontal line parallel to the x-axis corresponding to \$1,200 on the vertical axis (the y-axis). At the point where this line intersects the PV line, draw a vertical line down to the horizontal axis (the x-axis). The vertical line intersects the x-axis at 40 units, indicating that by selling 40 units Emma will earn an operating income of \$1,200.

Just like Emma, managers at larger companies such as California Pizza Kitchen use profit-volume analyses to understand how profits change with sales volumes. They use this understanding to target the sales levels they need to achieve to meet their profit plans.

Until now, we have ignored the effect of income taxes in our CVP analysis. In many companies, boards of directors want top executives and managers to consider the effect their decisions have on the company's operating income *after* income taxes because this is the measure that drives shareholders' dividends and returns. Some decisions might not result in a large operating income, but their favorable tax consequences make them attractive over other investments that have larger operating incomes but attract much higher taxes. CVP analysis can easily be adapted to consider the effect of taxes.

Income Taxes and Target Net Income

LEARNING OBJECTIVE 3

Understand how income taxes affect CVP analysis

...focus on net income

Net income is operating income plus nonoperating revenues (such as interest revenue) minus nonoperating costs (such as interest cost) minus income taxes. For simplicity, throughout this chapter we assume nonoperating revenues and nonoperating costs are zero. So, our net income equation is:

$$\text{Net income} = \text{Operating income} - \text{Income taxes}$$

To make net income evaluations, CVP calculations for target income must be stated in terms of target net income instead of target operating income. For example, Emma may be

interested in knowing the quantity of units of *GMAT Success* she must sell to earn a net income of \$960, assuming an income tax rate of 40%.

$$\text{Target net income} = \left(\frac{\text{Target}}{\text{operating income}} \right) - \left(\frac{\text{Target}}{\text{operating income}} \times \text{Tax rate} \right)$$

$$\text{Target net income} = (\text{Target operating income}) \times (1 - \text{Tax rate})$$

$$\text{Target operating income} = \frac{\text{Target net income}}{1 - \text{Tax rate}} = \frac{\$960}{1 - 0.40} = \$1,600$$

In other words, to earn a target net income of \$960, Emma's target operating income is \$1,600.

Proof:	Target operating income	\$1,600
	Tax at 40% (0.40 × \$1,600)	640
	Target net income	<u>\$ 960</u>

The key step is to take the target net income number and convert it into the corresponding target operating income number. We can then use equation 1 to determine the target operating income and substitute numbers from our *GMAT Success* example.

$$\left[\left(\frac{\text{Selling price}}{\text{price}} \times \frac{\text{Quantity of}}{\text{units sold}} \right) - \left(\frac{\text{Variable cost}}{\text{per unit}} \times \frac{\text{Quantity of}}{\text{units sold}} \right) \right] - \frac{\text{Fixed costs}}{\text{costs}} = \frac{\text{Operating income}}{\text{income}} \quad (\text{Equation 1})$$

$$(\$200 \times Q) - (\$120 \times Q) - \$2,000 = \$1,600$$

$$\$80 \times Q = \$3,600$$

$$Q = \$3,600 \div \$80 \text{ per unit} = 45 \text{ units}$$

Alternatively, we can calculate the number of units Emma must sell by using the contribution margin method and equation 4:

$$\begin{aligned} \text{Quantity of units required to be sold} &= \frac{\text{Fixed costs} + \text{Target operating income}}{\text{Contribution margin per unit}} \quad (\text{Equation 4}) \\ &= \frac{\$2,000 + \$1,600}{\$80 \text{ per unit}} = 45 \text{ units} \end{aligned}$$

Proof:	Revenues, \$200 per unit × 45 units	\$9,000
	Variable costs, \$120 per unit × 45 units	5,400
	Contribution margin	3,600
	Fixed costs	2,000
	Operating income	1,600
	Income taxes, \$1,600 × 0.40	640
	Net income	<u>\$ 960</u>

Emma can also use the PV graph in Exhibit 3-3. To earn the target operating income of \$1,600, Emma needs to sell 45 units.

Focusing the analysis on target net income instead of target operating income will not change the breakeven point because, by definition, operating income at the breakeven point is \$0 and no income taxes are paid when there is no operating income.

DECISION POINT

How can managers incorporate income taxes into CVP analysis?

Bernard Windows is a small company that installs windows. Its cost structure is as follows:

Selling price from each window installation	\$ 500
Variable cost of each window installation	\$ 400
Annual fixed costs	\$150,000
Tax rate	30%

Calculate the number of windows Bernard Windows must install and the revenues needed to earn a target net income of \$63,000.

3-3 TRY IT!

LEARNING OBJECTIVE 4

Explain how managers use CVP analysis to make decisions

...choose the alternative that maximizes operating income

Using CVP Analysis for Decision Making

You have learned how CVP analysis is useful for calculating the units that need to be sold to break even or to achieve a target operating income or target net income. A manager can also use CVP analysis to make other strategic decisions. Consider a decision about choosing the features for a product, such as the engine size, transmission system, or steering system for a new car model. Different choices will affect the vehicle's selling price, variable cost per unit, fixed costs, units sold, and operating income. CVP analysis helps managers make product decisions by estimating the expected profitability of these choices. We return to our *GMAT Success* example to show how Emma can use CVP analysis to make decisions about advertising and selling price.

Decision to Advertise

Suppose Emma anticipates selling 40 units of the *GMAT Success* package at the fair. Exhibit 3-3 indicates that Emma's operating income will be \$1,200. Emma is considering advertising the product and its features in the fair brochure. The advertisement will be a fixed cost of \$500. Emma thinks that advertising will increase sales by 10% to 44 packages. Should Emma advertise? The following table presents the CVP analysis.

	40 Packages Sold with No Advertising (1)	44 Packages Sold with Advertising (2)	Difference (3) = (2) - (1)
Revenues ($\$200 \times 40$; $\$200 \times 44$)	\$8,000	\$8,800	\$ 800
Variable costs ($\$120 \times 40$; $\$120 \times 44$)	4,800	5,280	480
Contribution margin ($\$80 \times 40$; $\$80 \times 44$)	3,200	3,520	320
Fixed costs	2,000	2,500	500
Operating income	<u>\$1,200</u>	<u>\$1,020</u>	<u>\$ (180)</u>

Operating income will decrease from \$1,200 to \$1,020, so Emma should not advertise. Note that Emma could focus only on the difference column and come to the same conclusion: If Emma advertises, contribution margin will increase by \$320 (revenues, \$800 - variable costs, \$480) and fixed costs will increase by \$500, resulting in a \$180 decrease in operating income.

When using CVP analysis, try evaluating your decisions based on differences rather than mechanically working through the contribution income statement. What if advertising costs were \$400 or \$600 instead of \$500? Analyzing differences allows managers to get to the heart of CVP analysis and sharpens their intuition by focusing only on the revenues and costs that will change as a result of a decision.

Decision to Reduce the Selling Price

Having decided not to advertise, Emma is contemplating whether to reduce the selling price to \$175. At this price, she thinks she will sell 50 units. At this quantity, the test-prep package company that supplies *GMAT Success* will sell the packages to Emma for \$115 per unit instead of \$120. Should Emma reduce the selling price?

Contribution margin from lowering price to \$175: ($\$175 - \115) per unit $\times$ 50 units	\$3,000
Contribution margin from maintaining price at \$200: ($\$200 - \120) per unit $\times$ 40 units	3,200
Change in contribution margin from lowering price	<u>\$ (200)</u>

Decreasing the price will reduce contribution margin by \$200 and, because the fixed costs of \$2,000 will not change, will also reduce Emma's operating income by \$200. Emma should not reduce the selling price.

Determining Target Prices

Emma could also ask, “At what price can I sell 50 units (purchased at \$115 per unit) and continue to earn an operating income of \$1,200?” The answer is \$179, as the following calculations show:

Target operating income	\$1,200
Add fixed costs	<u>2,000</u>
Target contribution margin	\$3,200
Divided by number of units sold	<u>÷ 50 units</u>
Target contribution margin per unit	\$ 64
Add variable cost per unit	<u>115</u>
Target selling price	<u>\$ 179</u>

Proof:	Revenues, \$179 per unit × 50 units	\$8,950
	Variable costs, \$115 per unit × 50 units	<u>5,750</u>
	Contribution margin	3,200
	Fixed costs	<u>2,000</u>
	Operating income	<u>\$1,200</u>

Emma should also examine the effects of other decisions, such as simultaneously increasing her advertising costs and raising or lowering the price of *GMAT Success* packages. In each case, Emma will estimate the effects these actions are likely to have on the demand for *GMAT Success*. She will then compare the changes in contribution margin (through the effects on selling prices, variable costs, and quantities of units sold) to the changes in fixed costs and choose the alternative that provides the highest operating income. Concepts in Action: Cost–Volume–Profit Analysis Makes Subway’s \$5 Foot-Long Sandwiches a Success But Innovation

DECISION POINT

How do managers use CVP analysis to make decisions?

CONCEPTS IN ACTION

Cost–Volume–Profit Analysis Makes Subway’s \$5 Foot-Long Sandwiches a Success But Innovation Challenges Loom



Julian Stratenschulte/dpa/picture-alliance/Newscom

Since 2008, the 44,000-location Subway restaurant chain has done big business with the success of its \$5 foot-long sandwich deal. Heavily advertised, the promotion lowered the price of many sandwiches, which attracted customers in droves and helped Subway significantly boost profits. Since introducing \$5 foot-longs, Subway has sold billions of the sandwiches worldwide.

How did Subway lower prices *and* boost profits, you may ask? Through higher volume and incremental sales of other items. When the price of foot-long sandwiches was lowered to \$5, contribution margin per sandwich dropped but customers flocked to Subway and sales skyrocketed increasing total contribution margin.

At least two-thirds of Subway customers purchase potato chips or a soft drink with their sandwich. Subway’s contribution margin on these items is very high, frequently as high as 70%. As the number of customers increased, the total contribution margin from these other items also increased. Fixed costs increased but the increases in contribution margin resulted in big increases in operating income.

But Subway faces challenges going forward. Its rapid sales growth has slowed as customer preferences have changed, and competitors from McDonalds to Firehouse Subs, Jimmy John’s, and Jersey Mike’s have begun offering more healthy menu options. If Subway is to continue to grow, it needs to get closer to its customers and continue to innovate its product offerings and its marketing.

Sources: Wendy Rotelli, “How Does Subway Profit From The \$5 Foot-Long Deal?” *Restaurant Business* blog, Restaurants.com, April 10, 2013 (<https://www.restaurants.com/blog/how-does-subway-profit-from-the-5-foot-long-deal>); Drew Harwell, “The Rise and Fall of Subway, the World’s Biggest Food Chain,” *Washington Post*, May 30, 2015 (https://www.washingtonpost.com/business/economy/the-rise-and-fall-of-subway-the-worlds-biggest-food-chain/2015/05/29/0ca0a84a-fa7a-11e4-a13c-193b1241d51a_story.html).